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DIVISION OF RESEARCH SERVICES
ANNUAL REPORT
FY 1969

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United States. National Institutes of Health

DIVISION OF RESEARCH SERVICES

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Report of Program Activities
July 1, 1968, through June 30, 1969

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NATIONAL INSTITUTES OF HEALTH

DIVISION OF RESEARCH SERVICES

Report of Program Activities
July 1, 1968, through June 30, 1969

A. Objectives

The Division of Research Services provides scientific, technical, and engineering services to support and further the research programs of the National Institutes of Health. All services are geared to the needs of Institute programs. Therefore the Division makes a continuous effort to keep informed of Institute plans. The DRS organization, staffing, and functions are adjusted accordingly to maintain an effective program of centralized services.

B. Current Programs

The Division comprises more than 1200 persons with almost 200 individual occupational skills and is composed of an Office of the Director and eight branches: Biomedical Engineering and Instrumentation, Environmental Services, Laboratory Aids, Library, Medical Arts and Photography, Plant Engineering, Construction Engineering, and Engineering Design.

The programs of the Division can be divided into two broad classifications:

1. Programs in direct support of research

    a. Design, development, and fabrication of instruments and materials
    b. Biomedical engineering of methods and systems
    c. Production of bacteriologic and tissue culture media
    d. Preparation of sterile glassware
    e. Production of genetically defined rodents and rabbits
    f. Quarantine and conditioning of dogs, cats, and primates
    g. Maintenance of farm animals
    h. Animal surgery and recovery
    i. Animal health services
    j. Still and motion picture photography
    k. Graphic arts services and exhibits design
    l. Medical illustration and model making
    m. Library services
    n. Foreign language translation

2. Programs related to NIH facilities and proper environment

    a. Engineering liaison in the design and construction of new NIH facilities
    b. Development of improved facilities and equipment
    c. Operation, maintenance, and repair of NIH physical facilities

d. Professional engineering and craft services for alterations, improvements, and installations
e. Maintenance of NIH grounds
f. Environmental services designed to maintain and improve the health of NIH patients and employees

C. Program Progress and Accomplishments

A reorganization was implemented in FY 1969 strengthening engineering capability to handle increased construction and maintenance workloads. It concerned the Research Facilities Planning Branch and the Plant Engineering Branch. Engineering and construction activities of the former Research Facilities Planning Branch and the Plant Engineering Branch were consolidated in an Engineering Design Branch and a Construction Engineering Branch. The PEB retained responsibility for operation, maintenance, and alterations of the NIH buildings and grounds.

In another Division reorganization, the Environmental Services Branch was restructured into three sections; Laboratory, Biological Control, and Engineering and Sanitation.

During the year, leadership of the Division changed hands when former Director Chris A. Hansen was named Commissioner of the new Environmental Control Administration (CPEHS). Dr. William B. DeWitt was named Acting Director. He is also Associate Director for Laboratory Resources. Prior to the reorganization, Ross Holliday, former Chief of the Plant Engineering Branch, was named Associate Director for Engineering Resources.

In other developments four Branch Chiefs, Dr. Raymond Zinn of the Laboratory Aids Branch, Edwin Lamphere of Environmental Services, Howard Biggs of the Construction Engineering Branch, and Jess Martin of the Library vacated their positions with the Division. With the exception of Mr. Martin, the other Branch Chiefs left to join CPEHS and Mr. Hansen. Acting Chiefs named were: Dr. Anton M. Allen, LAB; and Warren V. Powell, ESB. Subsequently, Vinson R. Oviatt was appointed ESB Chief and Seymour Taine was appointed Library Chief.

Management Information System

During FY 1969 the Division's management analysis staff directed its efforts mainly toward workload measurement within the plant engineering activities, and refinement of a Division-wide management information system. The availability of meaningful workload data has enabled management to improve the allocation of manpower resources. Backlogs can be analyzed to determine acceptability of productivity, and more precise judgements can be made on the need for overtime, scheduling of vacations and personnel details.

A computerized system for collecting and evaluating workload data was introduced in the first half of the fiscal year. During FY 1970 this system will be refined and, where feasible, broadened to improve control and planning of program operations.

Comparison of actual versus estimated costs of activities financed under the PHS Service and Supply Fund continued throughout the year. New prices were determined for Rodent and Rabbit Production in the Laboratory Aids Branch and recommendations for appropriate price changes were made to the Office of Financial Management.

Within the Medical Arts and Photography Branch, two work areas which had presented unusually complex problems in work measurement were added to the Division management information system. This system has given the Branch more accurate workload data, and has resulted in more efficient assignment of personnel to accommodate peak workloads.

Employee Development

DRS continued to emphasize and encourage training and development of DRS employees at all levels during FY '69. Results obtained from the Adult Basic Education Program conducted with the cooperation of the Montgomery County School System have been observed. Sixty-five first-line supervisors have completed a 44-hour in-house training course in supervision. This course includes 4 hours in problems relating to equal employment opportunity.

Three members of top management attended advanced management courses at the CSC Executive Seminar Center, Berkeley, California, in addition to other senior interagency managerial courses.

Of the 1200 DRS employees, about 160 attended courses offered by various colleges/universities, private manufacturing firms, and other non-Government educational activities. Also, 25 individuals attended courses offered by other Government agencies while approximately 100 attended numberous in-service courses offered by the DRS itself, NIH or other DHEW activities.

With supervisory/managerial training being stressed throughout the Federal Government, it is anticipated that FY '70 will show a continuing attendance increase in all forms of training by even larger numbers of DRS employees.

Personnel

Employee-Management Relations

A renewed agreement, with some revisions, was negotiated by NIH with the Washington Area Metal Trades Council to cover 45 employees in the Grounds Maintenance and Landscaping Section, Plant Engineering Branch. The renewed agreement was approved by DHEW on April 15, 1969. The NIH also negotiated an original agreement with the WAMTC (approved 9-10-68) covering more than 160 employees in the Shops Section, PEB. In early May 1969, DRS was advised informally that the AFGE would shortly ask for recognition to represent all nonsupervisory employees in the Library Branch (50), the Medical Arts and Photography Branch (50), and the Power Plant Unit, PEB (55). The Division has not yet received a formal written request for this recognition.

Shortage Category

In FY '69 as in past years, DRS experienced difficulty in recruiting professional engineers (all types), elevator repairers and pneumatic tube repairers. Advertisements for applicants were placed in newspapers, professional journals and the Army, Navy, Air Force Times with only limited success. In view of the unsettled picture concerning employment ceilings the Division does not plan any extensive advertising for applicants to fill these positions at this time.

Complaints

The DHEW issued a decision in December 1968 on the discrimination complaint filed by a group of Negro employees in the Grounds Maintenance and Landscaping Section. The case is now at the Civil Service Commission on appeal by the complainants. The Department's directives concerning this matter have been implemented. The Division Office and PEB are continuing efforts to improve the morale of the complainants and other employees in the GM&L Section.

Construction

Responsibility for construction which, in prior years, had been assigned to the Research Facilities Planning Branch and the Plant Engineering Branch is now the sole responsibility of the Construction Engineering Branch. Construction of large projects administered by the Public Buildings Service, General Services Administration, tapered off during the later part of FY 1969. Construction of the General Office Building Extension, Building 31C, and the Cancer-Neuro Mental Health and Cafeteria Buildings, 35, 36, and 37, was completed during the year. With the exception of the extension of the sanitary sewer by WSSC and the completion of the installation of switchgear in Building 46, PEPCO Substation, almost all work under Phase I of the Master Utilities Extension program was completed. The NINDS-NICHD Experimental Facility at Sabana Seca, Puerto Rico, is substantially complete. Alterations and additions to a number of the existing buildings were effected under separate contract through normal NIH procurement channels.

The current Engineering Design Branch program includes more than fourteen major projects in various stages of planning and design. Also included are design for alterations, plant maintenance and repair, improvements to existing NIH facilities, and a limited amount of development-type work.

Animal Programs

Emphasis was placed upon data processing of production and animal issue information in order to achieve greater efficiency in the utilization of limited production facilities. Efforts were made also to bring the price of animals more in line with cost of production of animals of different weights and ages at issue. Efforts to improve the quality of all animals furnished to intramural research programs were continued and intensified. For the second successive year, rodent and rabbit production colonies experienced no major outbreaks of disease. A program was initiated to establish rat colonies in barrier environment and thereby increase the security

of inbred foundation colonies and permit production of rats free of chronic respiratory disease.

With the establishment of a nutrition laboratory, more intensive research on animal foods was initiated and food specifications were revised, consistent with newer knowledge of the nutritional requirements of laboratory animals.

The colony of blood donor dogs was expanded and has continued to reduce significantly the number of dogs required for research purposes at NIH. The furnishing of blood reduced the need for dogs about 1300 animals below last year's requirement.

Library Services

A review of the personnel and services in all areas of the Library was made by the new Chief, LB, after his entry on duty in August. Significant deficiencies throughout the Library came to light during the review. The physical placement of the books and journals, equipment, and staff required substantial modification in order to effect a satisfactory layout. Functional ambiguity, organizational vagueness, dearth of documented,rational policies and procedures were observed. In order to resolve the trouble spots which were closely interrelated, a number of systematic depth studies were initiated throughout the Library.

A reorganization of the Branch was expected to be near completion by the end of the Fiscal Year. A Library Layout Study has been conducted to examine all phases of the layout of the new Library as its shakedown period neared an end. This would identify ways whereby the Library and its collection may be more conveniently and effectively used by the NIH community and the Library staff.

A meeting was held to consider a recommendation contained in the FY 1968 report that "a careful re-evaluation of the role of the Library Committee should be conducted and new guidelines developed." Discussions covered such topics as the physical layout of the Library, Library hours, identification cards, excessive photo-copy requests, the copyright suit against the NIH Library, and scope of the Library's collection.

Cutbacks in Library open hours necessitated by insufficient personnel were agreed to by the Scientific Directors and the Library Advisory Committee. Effective November 2, 1968 the Library was closed from 6:00 p.m. Saturdays until 8:30 a.m. Mondays and all day on holidays. Beginning January 12, 1969, additional open hours on Sundays and holidays from 1:00 to 5:00 p.m. were scheduled. The open hours 8:30 a.m. until 12:00 midnight Monday through Friday remained unchanged.

NIH Guards began daytime coverage of the Library on February 3, 1969 to ensure that all library books and journals taken from the Library were properly charged. It is anticipated this coverage will be extended to evening hours during FY 1970.

Biomedical Engineering

Changes were evident in the pattern of operation for BEIB, resulting from restrictions on budget and personnel.

Over the past several years, BEIB has built a unique group of highly competent professional and technical personnel and innovated programs that continue to improve the quality of service and support to the NIH mission. The Branch continues to stress enhancement of the individual by encouraging education and training programs; to build its level of professional contributions via stimulation of direct collaboration with intramural researchers; and to seek more economic methods for providing technical services.

Branch professional staff has been involved in approximately 180 research and development projects. Although the total number of projects has not changed significantly from the previous year, there continues to be a distinct increase in the level of sophistication of technical collaboration and support provided to the NIH community. The year has seen noteworthy original contributions in the areas of prostheses, materials, laser technology, mechanization, automation, physiological monitoring, patient care, and physiological systems analysis.

The Technical services sections, Instrument Fabrication and Systems Maintenance, achieved peaks in productivity during FY 1969. These sections performed 12,000 assignments during the year at a value of $1,000,000, an increase of 4 percent in jobs and 6 percent in dollars over the previous annual high reached in FY 1968.

The Supply Unit processed approximately 5,300 transactions for a dollar value in excess of $316,000.

The concept of satellite operation has been enhanced in substance. One new satellite, located in NCI, Building 37, has been established. Planning for a satellite for the proposed new NICHD complex has been initiated and a potential technical support unit for the NCI Baltimore Cancer Research Center is under discussion.

Medical Arts and Photography

With cutbacks in personnel and budget, major emphasis this year was on (1) improving and establishing production standards (2) streamlining work methods, (3) training, (4) achieving modest reorganization, and (5) capitalizing upon the move of MAPB Sections from dispersed locations to centralized quarters. Also a number of policies and administrative procedures were established to make it easier for NIH researchers to acquire services, to consolidate effort and talent, to achieve total production within MAPB and to deliver work within required time schedules. Record keeping and identification of overloads were made easier. A system of cross identifying requisitions reduced the number handled while a greater volume of work was achieved.

Environmental Services

The Branch was reorganized on the basis of functional programs one year ago. In the past year there has been demonstrated improved coordination of efforts and increased effectiveness in accomplishment of the Branch objective.

Increased emphasis was placed on better programming of activities. Those activities providing a larger overall contribution to the NIH environment received first attention. As a major part of the biological hazards control activities, assistance was given to NCI-DOW in evaluating Building 41 construction details, testing various barrier components of the building and training support service personnel who will occupy the building. This experience will provide the Branch with a greater staff competency for giving up-to-date technical assistance on biohazards activities to the Institutes and Divisions.

Better hood systems have been developed by industry to protect the environment of the researcher and his work. An important function of the environmental control program is to evaluate the new equipment for adequacy and to make periodic performance checks.

D. Problems

Construction

Design progress on new buildings and facilities has been slowed by budget reductions and reprogramming of appropriated funds to support other DHEW activities. Funded projects typically have not progressed according to schedule, with delays developing at each phase from initiation of the Program of Requirements through construction. These delays are most often the result of (1) review and approval by groups outside NIH, (2) unrealistic time schedules, (3) substantial program changes, (4) funding deficits, and (5) in-house manpower limitations.

Design progress on alterations, repairs and improvement projects has been meeting all the more important needs in a timely manner. However, these efforts have been handicapped to a significant degree by (1) delays in decisions on program alterations which crowd too much of the work into the last two quarters of the fiscal year, and (2) funding limits on repair and improvement projects. The former is the more significant problem in that it creates a considerable imbalance in the workload scheduling and often results in design periods which are too limited for thorough development.

The projected workload for FY 1970, added to the construction workload which was carried over from FY 1969, will require an increase in the staff for supervision and inspection.

Personnel

Government-wide personnel restrictions, which have curtailed the effectiveness of many federal programs, have also had an impact on Division services. Generally, demands for services have increased due to NIH expansion (five new buildings were completed and occupied) and reorganization, while personnel restrictions have reduced the Division staff. This has caused an excessive backlog of work and necessitated a re-ordering of priorities. The situation is expected to become more acute during FY 1970 when operating staff will continue to drop with no offsetting reduction in workload.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1968, through June 30, 1969

BIOMEDICAL ENGINEERING AND INSTRUMENTATION BRANCH Dr. Lester Goodman, Chief

I. SUMMARY

Fiscal year 1969 witnessed a marked change in the pattern of operation for BEIB. Unfortunately, federal budget and personnel restrictions limited the effectiveness of Branch programs.

Over the past several years, BEIB has built a unique group of highly competent professional and technical personnel and innovated programs that continue to improve the quality of service and support to the NIH mission. The Branch continues to stress enhancement of the individual by encouraging education and training programs; to build its level of professional contributions via stimulation of direct collaboration with intramural researchers; and to seek more economic methods for providing technical services.

Branch professional staff have been involved in approximately 180 research and development projects. Although the total number of projects has been reduced somewhat from the previous year, there continues to be a distinct increase in the level of sophistication of technical collaboration and support provided to the NIH community. The year has seen noteworthy original contributions in the areas of prostheses, materials, laser technology, mechanization, automation, physiological monitoring, patient care, and physiological systems analysis.

The technical services sections, Instrument Fabrication and Systems Maintenance, achieved peaks in productivity during FY 1969. These sections performed 12,000 assignments during the year at a value of $1,100,000, an increase of 4 percent in jobs and 6 percent in dollars over the previous annual high reached in FY 1968.

The Supply Unit processed approximately 5,300 transactions, amounting to a value in excess of $316,000.

The concept of satellite operation has been enhanced in substance. Our new satellite, located in NCI, Building 37, has been established. Planning for a satellite for the proposed new NICHD complex has been initiated and a potential technical support unit for the NCI Baltimore Cancer Research Center is under discussion.

A modest program for more economic use of scientific equipment has been improved and clearly demonstrates its potential for major savings. Experience to date shows growing acceptance of the concept and utilization by the NIH community.

Although full realization of potential has been curtailed by budgetary restrictions, a firm base for prompt, positive action is available when the occasion demands.

II. BRANCH PROGRAMS

A. Objectives

To fulfill the need for engineering knowledge and technical skills in pursuit of health research at NIH.

To provide direct and consultative engineering support to clinical and biomedical research projects, including advice on system analysis, experimental design, and synthesis of technical expedients.

To design, develop, fabricate, and evaluate special-purpose devices and systems not commercially available.

To maintain and repair scientific laboratory and clinical equipment.

To provide communication between NIH and the general public on engineering support to clinical and biomedical research.

To serve as a source of informed authority in matters pertaining to engineering in medicine and biology.

B. Current Programs

The primary purpose of the Branch is to provide service and support to the intramural program of the NIH. BEIB activities, therefore, are identified with many of the individual programs that constitute the intramural research effort. The overall Branch program is best described as the coordinated effort of its operating units.

1. Instrument Fabrication Section

a. Prepares minor designs of, makes modifications to, and fabricates biomedical equipment and instrumentation systems.

b. Produces devices requiring special tools and skills in the electronic, electrical, glass, mechanical, optical, rubber, plastics, welding, and sheet metal categories.

2. Systems Maintenance Section

a. Maintains and repairs biomedical equipment and instrumentation systems.

b. Instructs technicians and scientists in the proper use and operation of especially complex instruments and devices.

3. Electrical and Electronic Engineering Section

a. Collaborates with intramural professional staff in fundamental and applied projects relevant to biomedical research and health care.

b. Provides consultative electrical and electronic engineering support to biomedical research projects at NIH.

c. Designs, develops, and evaluates electrical and electronic instrumentation and equipment used in research and clinical applications.

d. Provides communication between NIH and the general public on electrical and electronic engineering support to biomedical research and clinical practice.

4. Chemical Engineering Section

a. Collaborates with intramural professional staff in fundamental and applied projects relevant to biomedical research and health care.

b. Provides consultative chemical engineering support to biomedical research projects at NIH.

c. Designs, develops, and evaluates chemical instrumentation and equipment used in research and clinical applications.

d. Provides communication between NIH and the general public on chemical engineering support to biomedical research and clinical practice.

5. Mechanical Engineering Section

a. Collaborates with intramural professional staff in fundamental and applied projects relevant to biomedical research and health care.

b. Provides consultative mechanical engineering support to biomedical research projects at NIH.

c. Designs, develops, and evaluates mechanical instrumentation and equipment used in research and clinical applications.

d. Provides communication between NIH and the general public on mechanical engineering support to biomedical research and clinical practice.

6. Branch Engineers

These senior professionals serve as staff consultants in the Office of the Chief and are assigned to organize, conduct, and oversee particular comprehensive, long-range research and development projects. They provide unique scientific and engineering knowledge to the Branch and NIH.

7. Supply Unit

Provides for the acquisition and disposition of materials, parts, and equipment required for Branch operations. Maintains controlled inventory stocks and records. Projected sales for the fiscal year exceeded $316,000.

8. Satellites

Satellites are technical support units, composed of selected engineers and technicians with appropriate shop facilities, located in certain areas where it is beneficial to make typical BEIB support and service immediately available via a controlled degree of decentralization. They are responsive to demands of local programs and operate as integral parts of the resident team but are administratively responsible to the central Branch. Each is especially tailored to meet specific needs of the host Institute or Division. Satellite operation supplies the host with the advantages of a proprietary technical group and maintains the chief benefits of centralized resources.

C. Program Progress and Accomplishments

The quality of service and support by BEIB to the research program of NIH continues to improve. This results directly from (1) emphasis on the role of professional physical scientists and engineers as collaborators in health research, and (2) improved capability of the technical services work force at a higher level of experience and competence.

1. Workload

The IFS processed approximately 4,500 different project assignments involving minor design, fabrication, or major modification. The SMS processed approximately 7,500 different project assignments involving maintenance, repair, or minor modification.

BEIB engineers were involved with approximately 180 different research and development projects. The number of comprehensive long-range projects with which the Branch is involved has significantly increased as BEIB's role in the NIH program evolves. Individual projects of special research interest are detailed in Section III. Program areas that continue to receive considerable attention are as follows:

a. Improved techniques and systems for physiological monitoring in surgery and intensive patient care.

b. Systems design and construction for mechanizing and automating laboratory and clinical procedures.

c. Research and development in artificial organs and prostheses, including studies of basic phenomena and construction of devices for artificial heart components and hemodialysis therapy.

d. Systems design and construction of devices to gain more benefits from automatic data processing and electronic computation and control.

e. Improving tools for cardiac and neurosurgery.

f. Developing the laser as a useful device in life science research and therapy, as well as extending its physical potential.

g. Research and development on the synthesis of special materials for biomedical applications.

h. Analysis and modeling of physiological phenomena especially related to therapeutic processes.

2. Technical Advances

BEIB has delivered a considerable number of special-purpose devices and systems in support of Institute research projects. Items of more than casual interest follow:

A high pressure ion-exchange chromatograph extends range and resolution of the technique to enable new investigations of abnormal metabolites in urine.

A drop-o-matic device dispenses precise volumes of reagents into test cells used in virological research. A 96-cup microtitration plate can be automatically filled in 20 seconds with drops ranging from .012 cc to .065 cc to within 2 percent.

An internal brain temperature telemetry system, with a range of 15 inches, operates with a 300 KC carrier pulsed at a rate proportional to temperature.

An automated processing unit for the LKB mass spectrometer conditions signals for tape recorder and galvonometer-recorder presentation and automatically sequences tape start, tape speed regulation, mass spectrum start, and system stop.

A baseline correction system, which improves accuracy of EPR apparatus, subtracts blank specimen sweeps from test specimen signals.

A rheometer measures shear in biological gels with a temperature controlled reciprocating precision viscometer with motions of .001 inches measured to .00001 inches over a frequency range of 50-400 Hz.

A solid state electrometer for use with a gas chromatograph, features short-term stability of 10 femto-amperes over a 10-minute period.

A modified syringe and syringe-needle washing machine incorporates a new operating concept to achieve the proper degree of cleanliness.

A digital electronic unit synchronizes the operation of a specimen sampler with a peristaltic pump used in automated clinical chemistry systems.

A solid state pH meter with unusually fast response from high impedance and high speed electrodes provides adjustable gain, offset, filtering, and output logging capabilities.

A slow "T-jump" apparatus regulates temperatures before and after the jump, using a novel feedback arrangement.

A log converter transforms spectrophotometer output from units of absorbance to units of optical density for strip chart recording.

A digital programmer for a protein sequenator provides for automatic recycling through a 30-stage operation.

A mechanized cabbage slicer, which destalks and quarters cabbages for animal feed, replaces a time-consuming, dangerous manual operation.

A vial filling and capping machine automatically fills and caps vials of nutrient media at the rate of 30 per minute.

An automatic pipette wrapping machine packages individual clean pipettes in sealed autoclavable paper envelopes at the rate of 900 per hour.

A homogenizer, which efficiently processes very small samples of bone, gristle, cartilage, fur, etc., is especially useful for contamination-free radioactive materials.

Strain-gaged forceps measure applied forces and deformations of sheep fetus skulls.

Improvements on Cary Spectrophotometers enable automatic absorbance range finding, intermittent sample selection, sequential base-line balancing, and hydrogen lamp hazard protection.

Special amateur radio stations housed in transportable console cabinets improve the capability of the PHS emergency radio network.

A special quartz cell provides for highly reliable continuous determinations of carbon^{14} and tritium in radioactive tracer investigations of animal tissue.

A novel quartz cell enables acquisition of Raman spectra for materials at 60°K(-400°F).

A dual ratio hydraulic micromanipulator permits electrode positioning with one micron incremental resolution for stimulating and recording from subcortical cells.

A view attachment for micromanipulators permits microscopic studies at the electrode-cortex interface in animal studies.

A unique short-arm centrifuge head greatly improves the purity of viable mammalian cell separations.

3. Inventory and Supply

Centralization of procurement operations, achieved during the previous fiscal year, and improved inventory procedures have enhanced service and provided Branch management with more concise cost analysis of operating expenses.

The use of blanket purchase orders was enlarged and improved during the past year. Simplified procurement procedures, resulting from increased delegation of procurement authority from the SMB Procurement Section, have materially reduced the volume of formal purchase orders and produced concomitant savings.

4. Service Contracts

The Branch encourages the use of contractual services, with special emphasis on service-type contract with certain scientific equipment suppliers. Fixed price contracts with Beckman Corporation, Spinco and Spid Divisions, have proven beneficial to the scientific staff. The class of equipment covered includes centrifuges, spectrophotometers, pH meters, gas chromatographs, and liquid scintillation counters. Specific benefits provide:

a. Consulting services on custom engineering modifications and special accessories.

b. Information for researchers and technicians on new techniques and applications as developed.

c. Guidance and assistance in setting up scheduled service and maintenance programs.

A contract with the Materials Evaluation Laboratory, National Bureau of Standards, provides NBS equipment and personnel for testing elastomer formulations and specimens provided by BEIB and reports on data such as rheograph curves and stress-strain relationships. It further provides data in support of the biomaterials development program which is not available at NIH because of lack of suitable equipment.

5. Training

An effective professional and technical training program provides improved, up-to-date support to NIH in engineering, fabrication, and maintenance. Fifty-four employees participated in academic and technical courses. Fifty-three (342-1/2 man days) attended formal education and training courses. Eight (65 man days) received specialized training on scientific equipment at suppliers' plants and at the NIH.

The following were conducted jointly by BEIB/SMS and Beckman Instrument Company under the terms of Contract #NIH-69-454:

a. Two five-day sessions were included in the Third Annual Amino Acid Analyzer Course presented by Dr. Erhard Gross, NICHD, to 31 scientific and technical attendees.

b. Three sections of the Ultracentrifuge Training Class met for one week each. A total of 37 persons attended, including, in addition to NIH employees, representatives from the Walter Reed Army Medical Center; Fort Detrick; Wyeth Laboratories, Philadelphia, and the University of Buenos Aires at Argentina. Instructors were Dr. Samuel Luborsky, NCI, and Dr. Marc Lewis, NINDS.

c. A three-week laboratory session, part of the Analytical Ultracentrifugation course offered by the NIH Graduate Program, AFES, was attended by 38 students. Dr. Luborsky and Dr. Lewis were the instructors for this course also, which was held in the SMS area.

d. A two-day training seminar in the theory and usage of Schlieren optics, in conjunction with the Beckman preparative ultracentrifuge, was attended by 45 persons. Dr. C. Cervenka, Application Engineer, lectured on theoretical considerations.

6. Equipment Utilization

In cooperation with the Supply Management Branch, BEIB has improved the mechanism for utilization of used scientific equipment. When items are declared excess to SMB, the property transfer orders are routed through BEIB, which inspects the equipment and judges the feasibility and cost of repair. When advisable, BEIB restores the equipment to good condition.

The SMS, BEIB, maintains a comprehensive inventory of useful scientific equipment which is made available for loan to NIH researchers on a request basis. When a request to use a device is for one year or more, a property transfer is arranged. When the request is for short-term use, it is loaned without cost and then returned to the loan pool.

BEIB also maintains a sizable number of certain classes of equipment to replace components when the user's equipment is in the shop for repairs.

At the present time, there are about 200 significant items in the loan pool. Approximately 60 of these are on loan at any given time. Over the course of the past year, approximately 60 items have been acquired from SMB's excess property, refurbished by BEIB, and transferred to users on a permanent basis.

D. Problems

1. Personnel

Increased federal salaries and improved recruitment practices have contributed to a significant increase in the number of qualified professionals seeking engineering positions in the Branch. Ceiling restrictions in effect throughout the fiscal year have, however, drastically curtailed program developments in such important areas as artificial organs, materials development, and mechanization and automation of laboratory and clinical procedures.

Better programs and procedures are needed to develop and recruit technicians, from a variety of trades and disciplines, who have competence relevant to the Branch mission.

More progressive application of policies and procedures and generally superior service at the Division level have enabled the Branch to improve its support to the NIH intramural research program. There is a need, however, to examine policies and procedures elsewhere at NIH and at higher levels to insure that this Branch is able to compete equitably in the recruitment and retention of qualified personnel.

2. Space

Had not drastic personnel ceiling restrictions been imposed during the year, overcrowding for the engineering sections would now be most serious. It is essential that appropriate measures be planned for the time when such constraints are relaxed. Renovation of the Building 10 Satellite Unit space during the previous fiscal year helped to relieve problems of overcrowding and noisy working conditions somewhat. Additional adjacent space is still required, however, if the satellite is to fulfill its purpose most effectively.

Expansion of the equipment utilization program requires additional space adjacent to the Systems Maintenance Section if it is to meet the growing demands of the NIH intramural research staff.

3. Budget

Current projects of a continuing nature are already being jeopardized by expected curtailment of the FY 1970 budget. Funding of anticipated pay raises within the limit of current resources will seriously reduce the effectiveness of service and support to the NIH intramural research program and have a serious adverse effect on important projects initiated by BEIB professionals.

E. Program Plans

The severe constraints on budget and personnel ceilings that were invoked during FY 1969 sharply retarded progress on program plans made in earlier years. Issues that remain unfulfilled include:

1. Implementation of a new NIH organization for more comprehensive coordination of engineering and physical sciences with medicine and biology.

2. Installation and operation of an NIH-wide economic scientific equipment utilization program.

3. Establishment of additional satellite technical support units.

4. Improvement of mechanisms for development and transfer of engineering innovations to biomedical research applications within the NIH structure.

Uncertainties regarding organizational and financial expectations for the near future demand a rather conservative planning philosophy. Significant expansion of program is not anticipated, but major emphasis will be placed on careful selection of priorities to make the best possible use of available resources and guarantee a competent group that is prepared to respond quickly to changes as they occur.

Progress continues in the level of contribution by BEIB scientists and engineers to NIH research programs. The innovating and developing of new concepts and their acceptance by intramural scientists have continued to grow. The Branch expects to maintain its efforts in promoting these trends and extending work in areas such as physiological monitoring for patient care, new diagnostic and surgical tools, mechanization and automation, artificial therapeutic devices, laser technology, physiological systems analysis, and biomaterials.

The Branch has launched a new phase of collaborative work with intramural scientists and private sector institutions via engineering development contracts. Two topical areas have been cited for which contracts will be awarded and monitored by BEIB:

1. Multiple Parameter, Intravascular Monitoring Catheter System

2. Large-scale Production of Biological Materials

It is anticipated that this collaborative contract operation will establish a new pattern for BEIB which should help to maximize the utilization of its professional talent and improve its effectiveness as a contributor to the overall NIH program.

F. Publications, Presentations

1. Publications

Battig, C. G.: Electrosurgical burn injuries and their prevention. Journal of the American Medical Association, 204: 1025-1029, 1968.

_____: Checking for electrical shock hazards. Anesthesiology, 29: (5) 1046, 1968.

Bischoff, K. B. and Dedrick, R. L.: Thiopental pharmacokinetics. Journal of Pharmaceutical Sciences, 57: 1346, 1968.

_____: Discussion of correlations of blood coagulation with surface properties of materials. Journal of Biomedical Materials Research, 2: 89-93, 1968.

Boretos, J. W. and Pierce, W. S.: Segmented polyurethane: A polyether polymer. An initial evaluation for biomedical applications. Journal of Biomedical Materials Research, 2: 121-130, 1968.

Bourgeois, L. D., Nutt, D. A., and Young, V. M.: New antibiotic disc dispenser. Applied Microbiology, 16: (10), 1606-1607, 1968.

Cohen, G. S.: Keeping a close watch on the critical patient. Instrumentation Technology (J. ISA), 15: (8), 71-74, 1968.

Cohen, G. S.: State of the art: Intensive care equipment. In J. N. Martin (Ed.) Biomedical Sciences Instrumentation, Vol. 5. Proceedings of the 6th National ISA Biomedical Sciences Instrumentation Symposium, Pittsburgh, Pa., 1968, pp. 11-16.

Dedrick, R. L.: Observations on biomedical engineering. Transactions of the New York Academy of Sciences, Series II, 30: (5), 677-689, 1968.

_____, Gabelnick, H. L., and Bischoff, K. B.: Kinetics of urea distribution. In Proceedings of the Annual Conference on Engineering in Medicine and Biology, 1968, Houston, Texas, Vol. 10. The Conference Committee for the 21st Annual Conference on Engineering in Medicine and Biology, L. A. Geddes, Chairman, Baylor University, College of Medicine, p. 36.1. (Paper presented in Houston, Texas, November 1968)

Dutton, R. C., Baier, R. E., Dedrick, R. L., and Bowman, R. L.: Initial thrombus formation on foreign surfaces. Transactions of the American Society for Artificial Internal Organs, 14: 57, 1968.

Friauf, W. S.: Letter to Editor, Simplified application of Kubelka-Munk Theory to absorption spectroscopy. Applied Optics, 7: 2417-2418, 1968.

_____: Simplified strobing of ten line code. Electronic Design. (In press)

_____: Rats: Their comings and goings. NTC '69 Record. National Telemetering Conference, Washington Hilton Hotel, Washington, D. C., April 22-24, 1969. Published by the Institute of Electrical and Electronic Engineers, Inc., New York, New York, pp. 34-38.

Fuhrer, J. S., Boerth, R. C., and Covell, J. W.: A technique for the control of wall stress in the canine left ventricle. In Proceedings of the Annual Conference on Engineering in Medicine and Biology, 1968, Houston, Texas, Vol. 10. The Conference Committee for the 21st Annual Conference on Engineering in Medicine and Biology, L. A. Geddes, Chairman, Baylor University, College of Medicine, p. 35A3. (Paper presented in Houston, Texas, November 1968)

Goodman, L.: Biomedical engineering and the requirements of a user. Laboratory Management, p. 26 ff, 1968. Also published in Conference on Impact of Bio-Engineering on Engineering Education, Aug. 29-31, 1966, Gatlinburg, Tennessee, pp. 115-120 (Conf.-660838).

_____: Medical control systems. In revised edition, McGraw-Hill Encyclopedia of Science and Technology. (In press)

_____: Clinical implications of equipment characteristics. Proceedings of Meeting, Computer Applications in Clinical Electrocardiography, American College of Cardiology. (In press)

Hoye, R. C., Thomas, L. B., Riggle, G. C., and Ketcham, A.: Effects of neodymium laser on normal liver and Vx2 carcinoma transplanted into the liver of experimental animals. Journal of the National Cancer Institute, 41: 1071-1082, 1968.

Ketcham, A. S., Hoye, R. C., and Riggle, G. C.: The laser - its role in cancer. Chapter 8, in Ariel, I. M. (Ed.): Progress in Clinical Cancer, Vol. 4. New York City, Grune and Stratton, 1969. (In press)

Mann, P. E. G. and Boretos, J. W.: A low dead space feline anesthetic mask. Laboratory Animal Care, 18: (6), 657-659, 1968.

Ommaya, A. K., Boretos, J. W., and Beile, E. E.: The lexan calvarium: An improved method for direct observation of the brain. Journal of Neurosurgery, XXX: (1), 25-29, 1969.

Peterson, J. I.: Gel-electrophoresis destaining apparatus. Analytical Biochemistry, 25: 257-259, 1968.

_____: Urinary glucose measurement. Clinical Chemistry, 14: 513-520, 1968.

_____ and Young, D. S.: Evaluation of the hexokinase/glucose-6-phosphate dehydrogenase method of determination of glucose in urine. Analytical Biochemistry, 23: (2), 301-316, 1968.

_____, Wagner, F., Anderson, F., and Thomas, G. M., Jr.: Design and testing of some automatic sample introduction valves for liquid chromatographs. Analytical Biochemistry. (In press)

Pierce, W. S., Turner, Jr., M. C., Boretos, J. W., Nolan, S. P., and Morrow, A. G.: The development and experimental evaluation of an implantable left ventricular bypass pump. Surgery (In press)

Pool, P. E., Norris, G. F., Lewis, R. M., and Covell, J. W.: A biopsy drill permitting rapid freezing. Journal of Applied Physiology, 24: (6), 832, 1968.

Riggle, G. C., Hoye, R. C., Farmer, J., and Ketcham, A. S.: Effect of hi-power neodymium laser on normal and tumor tissue. In Proceedings of the Annual Conference on Engineering in Medicine and Biology, 1968, Houston, Texas, Vol.10. The Conference Committee for the 21st Annual Conference on Engineering in Medicine and Biology, L. A. Geddes, Chairman, Baylor University, College of Medicine, p. 6.7. (Paper presented in Houston, Texas, November 1968)

_____ and Stotler, W. F.: A neodymium laser system for medical research. Digest of the 2nd Canadian Medical and Biological Engineering Conference, Toronto, Canada, September 9-11, p. 5.4, 1968. (Paper presented in Toronto, September 1968)

_____, Hoye, R. C., Farmer, J., and Ketcham, A. S.: "Q" switched neodymium laser effects on tissue. The Record of the Electron, Ion, & Laser Beam Technology Symposium. (In press) (Paper presented in Gaithersburg, Maryland, May 1969)

Schuette, W. H. and Simon, A. L.: A new device for recording cardiac motion. Medical Research Engineering, 25-27, Third Quarter, 1968.

Turner, M. C., Pierce, W. S., Metz, H. D., and Goodman, L.: An implantable valveless heart assist pump. Paper No. 68-WA/Aut-10. Winter Annual Meeting, American Society of Mechanical Engineers, New York, New York, December 1-5, 1968. (Paper presented in New York City, December 1968) Also in press, Transactions of the ASME Journal of Basic Engineering, ASME Headquarters, New York City.

_____ and Schaeffer, R. L.: Simple kit developed for environmental testing. Hospitals JAHA, 90-94, 1969.

2. Presentations

Battig, C. G.: Engineering for hospital safety. Southern Area Research and Development Safety Symposium, Oak Ridge National Laboratory, Oak Ridge, Tennessee, April 1969.

Bischoff, K. B.: Concepts of pharmacokinetic analysis. Pharmacology Committee, Acute Leukemia Task Force, National Cancer Institute, NIH, Bethesda, Maryland, June 1968.

_____: Advanced chemical reactor analysis. Engineering North Conferences, Glen Arbor, Michigan, August 1968.

_____: Structure, function and opportunities in the Biomedical Engineering and Instrumentation Branch. Workshop in Bioengineering, Annual Meeting of American Institute of Chemical Engineers, Los Angeles, December 1968.

_____: Some aspects of the pharmacokinetics of a cancer chemotherapy agent - methotrexate. (Paper coauthored by R. L. Dedrick and D. S. Zaharko) Symposium on Chemical Engineering in Medicine, 157th National Meeting of the American Chemical Society, Minneapolis, Minnesota, April 1969.

Dedrick, R. L.: Initial events that occur during thrombosis on foreign surfaces. Gordon Research Conference on Environmental Sciences: Water; New Hampton, New Hampshire, June 1968.

_____: The artificial kidney. Graduate Seminar, Department of Chemical and Petroleum Engineering, University of Pittsburgh, October 1968.

_____: Drug distribution in the body during artificial kidney treatment. Chemical Engineering Seminar, Polytechnic Institute of Brooklyn, New York, December 1968.

_____: Pharmacokinetics related to the artificial kidney. Chemical Engineering Seminar, University of Delaware, Newark, December 1968.

_____: Progress of chemical engineering in medicine and biology. Symposium on Interphase Mass Transfer in Biological Systems, National Meeting of the American Institute of Chemical Engineering in Medicine and Biology, New Orleans, Louisiana, March 1969.

_____: Pharmacokinetics related to the artificial kidney. Biomedical Engineering Symposium, University of Cincinnati, Ohio, March 1969.

_____: Observations on biomedical engineering. Allerton Honors Conference, University of Illinois, Urbana, March 1969.

_____: Pharmacokinetics related to the artificial kidney. Seminar, Department of Chemical Engineering, University of Rochester, New York, May 1969.

_____: Biomedical engineering and instrumentation development. Orientation Course for Engineers and Other Environmental Health Personnel, USPHS:

Cincinnati, Ohio, December 1968
Tucson, Arizona, January 1969
Rockville, Maryland, April 1969
Research Triangle Park, North Carolina, May 1969

Goodman, L.: The intersection of technology with medicine. 1968 Autumn Meeting of the National Academy of Engineering, International Conference Suite, U. S. Department of State, Washington, D. C., October 1968.

_____: NIH representative on the "Discussion: NIH" radio program presented by Station WGMS, November 1968 and May 1969.

_____: Opportunities for new bioengineering inventions. Annual Conference of the Los Angeles Section of the Instrument Society of America, January 1969.

_____: NBC "NIH REPORTS" Television Series: Materials in human prostheses, February 2; Laser power in medicine, February 9; Patient monitoring, February 23, 1969.

_____: Government support of medical electronics development. Medical World News Conference on Electronics in Medicine, New York City, February 1969.

_____: Biomedical engineering projects at the NIH. Biomedical Seminar, Georgia Institute of Technology, Atlanta, Georgia, February 1969.

_____: Biomedical engineering at the NIH. Medical College of South Carolina, Charleston, March 1969.

_____: Biomedical engineering projects conducted by NIH's Division of Research Services. Joint meeting of the Frederick County Medical Association and the Frederick Chapter of the Maryland Society of Professional Engineers, Frederick, Maryland, March 1969.

_____: Engineering in medicine and biology. Science classes, Bethesda-Chevy Chase High School, Bethesda, Maryland, May 1969.

_____: Opportunities for industrial, university, and medical institutions for engineering in biology and medicine. Central Ohio Bioengineering Coordinating Committee, Columbus, Ohio, May 1969.

Riggle, G. C.: Effects of high power neodymium laser on normal liver and S-91 melanoma. Gordon Conference on Lasers in Medicine and Biology, Holderness, New Hampshire, July 1968.

_____: Engineering the laser for medical uses. Graduate Engineering Seminar, Catholic University, Washington, D. C., October 1968.

_____: Lasers in medicine. Short course on Medical Engineering, School of Engineering, George Washington University, December 1968.

_____: Biomedical engineering developments at the National Institutes of Health. Medical School, University of Oregon, Portland, Oregon, April 1969.

_____: Protective measures for laser medical facilities. Bureau of Radiological Health, Rockville, Maryland, short course on Fundamentals of Non-ionizing Radiation Protection, May 1969.

SECTION III (Individual Project Reports) follows.

Serial No. DRS-BEIB-1

1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Mathematical Analysis of Pharmacokinetics - Cancer Chemotherapy

Previous Serial Number: DRS-BEIB-1 (1968)

Principal Investigators: Kenneth B. Bischoff, Robert L. Dedrick, Daniel S. Zaharko

Other Investigator: Vincent T. Oliverio

Cooperating Unit: LCP-NCI

Man Years:

Total:	1.5
Professional:	1.3
Others:	0.2

Project Description:

Objectives: To develop mathematical models of the distribution of anti-neoplastic drugs in order to:

(1) Account for inter-species differences in drug distribution kinetics.

(2) Predict drug concentration history at any relevant site as a function of dose schedule and route of administration to provide a rational basis for optimization of therapy.

Methods Employed: Mathematical models are developed which make maximum use of physicochemical, physiological, and anatomical information. The resulting differential equations are solved analytically or numerically, and the results are compared with experimental data. Areas of insufficient information are clarified, by additional experiments, and the models are simplified or otherwise modified as appropriate.

Major Findings: Methotrexate distributes rapidly after i.v. injection in mice. Tissue: plasma distribution coefficients vary greatly (liver 10:1; kidney 3:1; muscle 0.15:1). Drug removal occurs by excretion in the kidney and in the bile. Intestinal reabsorption appears important in maintaining plasma concentration. A mathematical model has been developed which describes the drug concentrations as a function of time in several tissues and predicts the observed rapid redistribution phase, moderately rapid removal, and subsequent leveling of plasma concentration.

Significance to Biomedical Research and the Program of the Institute:
A major obstacle to more rapid progress in cancer chemotherapy is the rather large inter-species differences that occur in toxicity. At present, it is not generally possible to predict reliably the effect on man from results obtained with lower animals. The ability to predict the drug concentration-time behavior at any relevant site as a function of dose schedule and route of administration would provide a more rational framework for accounting for inter-species differences and for therapeutic optimization.

Proposed Course of Project: Mathematical modeling of methotrexate distribution in mice will be continued to include more detailed information on absorption. Preliminary work to predict the effect of different close levels and routes of administration and extrapolation to other species will be continued. It is anticipated that some effort will be devoted to a study of the kinetics of cell death with stochastic models as appropriate.

Serial No. DRS-BEIB-2

1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Experimental Hemodialysis for Studying Electrolyte Transport In Vivo

Previous Serial Number: DRS-BEIB-2 (1968 - Mathematical Analysis of Pharmacokinetics - Effect of Artificial Kidney)

Principal Investigators: Henry L. Gabelnick, Robert S. Bourke

Other Investigator: Robert L. Dedrick

Cooperating Unit: LNC-NINDS

Man Years:

Total:	3.0
Professional:	2.0
Others:	1.0

Project Description:

Objectives: To study the removal of chloride from the body under iso-osmotic conditions with emphasis on transport in the central nervous system (CNS) as an aid to understanding the mechanism of brain edema.

Methods Employed: Hemodialysis was used to substitute isethionate for chloride ions in cats iso-osmotically so that there would be no net water flux in the tissues because of osmotic pressure. Radioactive chloride was used to obtain transport parameters in the CNS. The differential equations describing the overall transport model will be solved numerically on a digital computer.

Major Findings: Although most of the Cl^- in body tissues remained in equilibrium with the plasma over the time scale of the experiments, Cl^- was conserved by the CNS. Application of a membrane limited transport model to Cl^{36} uptake data indicated active transport into cerebrospinal fluid (CSF) and passive diffusion into cerebral cortex and corpus callosum.

Significance to Biomedical Research and the Program of the Institute: Previous in vitro work by one of the investigators has indicated Cl^- distribution to be a key factor in brain edema. The current work is providing basic information on in vivo Cl^- transport and also background on techniques for replacing Cl^- with isethionate for possible clinical treatment of edema.

Proposed Course of Project: Work will be continued on establishing a general mathematical model to describe electrolyte and small molecule transport in vivo during dialysis. The effect of the CSF chloride pump and whether it is sufficient to explain the observed conservation of Cl^- in the CNS during dialysis will also be investigated. In addition, attempts will be made to establish an animal model of edema and treat it with dialysis.

Publications:

Bischoff, K. B. and Dedrick, R. L.: Pharmacokinetics of artificial kidney therapy for poisons. Proceedings of the Annual Conference on Engineering in Medicine and Biology, 1967, Boston, Massachusetts, Vol. 9. The Conference Committee for the 20th Annual Conference on Engineering in Medicine and Biology, Murray Eden, Chairman, Massachusetts Institute of Technology, p. 8.6.

_____ and _____: Thiopental pharmacokinetics. J. Phar. Sci. 57: 1346-1351, 1968.

Dedrick, R. L. and Bischoff, K. B.: Pharmacokinetics in applications of the artificial kidney. In Dedrick, R. L., Bischoff, K. B., and Leonard, E. F. (Eds.): The artificial kidney. Chemical Engineering Progress Symposium Series (no. 84). New York, N. Y., American Institute of Chemical Engineers, 1968, vol. 64, pp. 32-44.

_____, Gabelnick, H. L., and Bischoff, K. B.: Kinetics of urea distribution. Proceedings of the Annual Conference on Engineering in Medicine and Biology, 1968, Houston, Texas, Vol. 10. The Conference Committee for the 21st Annual Conference on Engineering in Medicine and Biology, L. A. Geddes, Chairman, Baylor University College of Medicine, p. 36.1.

Serial No. DRS-BEIB-3

1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Segmented Polyurethane

Previous Serial Number: DRS-BEIB-3 (1968)

Principal Investigator: John W. Boretos

Other Investigators: Don E. Detmer, Frank R. Wagner, Nina S. Braunwald

Cooperating Units: SB-NHI, National Bureau of Standards

Man Years:

Total:	1.00
Professional:	0.80
Others:	0.20

Project Description:

Objectives: To conduct research on segmented polyurethane directed toward evaluating its chemical and physico-mechanical properties. In addition, modifications of the polymer will be investigated to enhance its utilization for biomedical applications.

Methods Employed: Several specific areas of investigation are

(1) Long-term implants - hydrolytic effects
(2) Permeability
(3) Particle fragmentation in heart pump sets
(4) Polymer modifications

Major Findings:

(1) Subcutaneous implants in dogs show no major changes in tensile properties after nine months. No deleterious effect on adjacent tissue is noted. Observations will continue for a period of two to five years.

(2) In vitro tests have shown segmented polyurethane to be nine times more resistant to abrasion than medical grade silicone rubber.

(3) Knitted fibers of segmented polyurethane performed well as a covering for struts of "Starr-Edwards" heart valves.

(4) Segmented polyurethane poppets for low profile heart valves show minimal wear over six months of implantation in calves. Dacron® cloth-covered valve cage struts also show no wear in this configuration.

Significance to Biomedical Research and the Program of the Institute: A stable elastomer with high strength properties and physiological compatibility is needed for clinical prostheses.

Proposed Course of Project: Continuation of the proposed evaluation work with the manufacturer of the basic polymer to make it available to the scientific community.

Publications:

Boretos, J. W. and Pierce, W. S.: Segmented polyurethane: A new elastomer for biomedical applications. Science 158, No. 3807, 1481-1482, 1967.

_____ and _____: Segmented polyurethane: A polyether polymer. An initial evaluation for biomedical applications. J. Biomed. Mater. Res. 2: 121-130, 1968.

_____: Procedures for the Fabrication of Segmented Polyurethane-Polymers into Useful Biomedical Prostheses. National Institutes of Health, Division of Research Services, Biomedical Engineering and Instrumentation Branch, Bethesda, Md., 1968, 16 pp.

Serial No. DRS-BEIB-4

1. Biomedical Engineering and Instrumentation Branch
2. Chemical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Head Injury Investigation: Calvarium

Previous Serial Number: DRS-BEIB None

Principal Investigators: Ayub K. Ommaya, John W. Boretos

Other Investigators: Nicholas E. Grivas, Kenneth M. Nelson, David C. McCullough

Cooperating Units: SB, NINDS; Naval Ship Research and Development Center

Man Years:

Total:	.95
Professional:	.80
Others:	.15

Project Description:

Objectives:

(1) To develop a transparent polycarbonate calvarium suitable for chronic visual observations of the brain under conditions of trauma.

(2) To evaluate the physiological compatibility of polycarbonate as a skull replacement material when used for human cranioplasty.

(3) To afford a means of studying brain edema following surgery or injury.

Methods Employed:

(1) Thermoforming fabrication methods were adapted along with conventional "impression-duplication" methods as employed by prosthedontists.

(2) Auxiliary apparatus for stimulating, recording, and traumatizing were designed and attached to the calvarium.

(3) High speed photography and photo sensitive dyes were used to define results.

Major Findings:

(1) A polycarbonate calvarium can be conveniently produced during the interval of the surgical procedure. The prosthesis conforms to the bony defect and simulates the removed skull while providing a transparent window to both hemispheres of the brain.

(2) The polymer is physiologically tolerated during acute experiments.

Significance to Biomedical Research and the Program of the Institute:
A quantitative knowledge of the forces that are considered damaging to the brain is needed. The value of protective devices that guard against whiplash and concussion must be evaluated in terms of brain damage incurred. Methods of studying and treating cerebral edema following contusion and surgery would be directly beneficial to patients.

Proposed Course of Project:
The establishment of reliable models for induced trauma is envisioned. Also, the method offers a possible improvement to patient care for cranioplasty. Polymer stability, low heat transfer, and high impact resistance are primary attributes to be considered. Long-term studies are appropriate for verification of physiological compatibility and susceptibility to physical properties degradation.

Publication:

Ommaya, A. K., Boretos, J. W., and Beile, E. E.: The lexan calvarium: An improved method for direct observation of the brain. J. Neurosurg., XXX: (1), 25-26, 1969.

Serial No. DRS-BEIB-5

1. Biomedical Engineering and Instrumentation Branch
2. Electrical and Electronic Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Myocardial Infarction Research Unit Instrumentation and Data Acquisition Systems

Previous Serial Number: DRS-BEIB-4 (1968)

Principal Investigators: Robert J. Pettitt, Glenn A. Rahmoeller

Other Investigator: Peter L. Frommer

Cooperating Unit: MI-NHI

Man Years:

Total:	1.5
Professional:	1.0
Others:	0.5

Project Description:

Objective: To improve methods for intensive patient study and coronary care via design and development of new instrumentation systems.

Methods Employed: Collaboration with NHI-MI program office and staff of Myocardial Infarction Research Unit (MIRU) centers on systems analysis and design of monitoring and control methods. Research and experimentation on new instrumentation techniques.

Major Findings: Design and technical specifications for the analog instrumentation and data acquisition system at the Massachusetts General Hospital have been completed. A contract has been awarded to Lockheed Electronics Co. to build the system. Research has produced several promising new techniques for data handling and cardiotachometry.

Significance to Biomedical Research and the Program of the Institute: Advancements in analog instrumentation and data acquisition systems are essential to the general problem of health research and patient care.

Proposed Course of Project: Continued consultative support to the MIRU program office and to the MIRU centers with significant responsibility for technical aspects of the instrumentation system at the Massachusetts General Hospital. Research will continue on improved coronary care unit monitoring equipment.

Significance to Biomedical Research and the Program of the Institute:
A quantitative knowledge of the forces that are considered damaging to the brain is needed. The value of protective devices that guard against whiplash and concussion must be evaluated in terms of brain damage incurred. Methods of studying and treating cerebral edema following contusion and surgery would be directly beneficial to patients.

Proposed Course of Project:
The establishment of reliable models for induced trauma is envisioned. Also, the method offers a possible improvement to patient care for cranioplasty. Polymer stability, low heat transfer, and high impact resistance are primary attributes to be considered. Long-term studies are appropriate for verification of physiological compatibility and susceptibility to physical properties degradation.

Publication:

Ommaya, A. K., Boretos, J. W., and Beile, E. E.: The lexan calvarium: An improved method for direct observation of the brain. J. Neurosurg., XXX: (1), 25-26, 1969.

Serial No. DRS-BEIB-5

1. Biomedical Engineering and Instrumentation Branch
2. Electrical and Electronic Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Myocardial Infarction Research Unit Instrumentation and Data Acquisition Systems

Previous Serial Number: DRS-BEIB-4 (1968)

Principal Investigators: Robert J. Pettitt, Glenn A. Rahmoeller

Other Investigator: Peter L. Frommer

Cooperating Unit: MI-NHI

Man Years:

Total:	1.5
Professional:	1.0
Others:	0.5

Project Description:

Objective: To improve methods for intensive patient study and coronary care via design and development of new instrumentation systems.

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Significance to Biomedical Research and the Program of the Institute: Advancements in analog instrumentation and data acquisition systems are essential to the general problem of health research and patient care.

Proposed Course of Project: Continued consultative support to the MIRU program office and to the MIRU centers with significant responsibility for technical aspects of the instrumentation system at the Massachusetts General Hospital. Research will continue on improved coronary care unit monitoring equipment.

Significance to Biomedical Research and the Program of the Institute:
A quantitative knowledge of the forces that are considered damaging to the brain is needed. The value of protective devices that guard against whiplash and concussion must be evaluated in terms of brain damage incurred. Methods of studying and treating cerebral edema following contusion and surgery would be directly beneficial to patients.

Proposed Course of Project:
The establishment of reliable models for induced trauma is envisioned. Also, the method offers a possible improvement to patient care for cranioplasty. Polymer stability, low heat transfer, and high impact resistance are primary attributes to be considered. Long-term studies are appropriate for verification of physiological compatibility and susceptibility to physical properties degradation.

Publication:

Ommaya, A. K., Boretos, J. W., and Beile, E. E.: The lexan calvarium: An improved method for direct observation of the brain. J. Neurosurg., XXX: (1), 25-26, 1969.

Serial No. DRS-BEIB-5

1. Biomedical Engineering and Instrumentation Branch
2. Electrical and Electronic Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Myocardial Infarction Research Unit Instrumentation and Data Acquisition Systems

Previous Serial Number: DRS-BEIB-4 (1968)

Principal Investigators: Robert J. Pettitt, Glenn A. Rahmoeller

Other Investigator: Peter L. Frommer

Cooperating Unit: MI-NHI

Man Years:

Total:	1.5
Professional:	1.0
Others:	0.5

Project Description:

Objective: To improve methods for intensive patient study and coronary care via design and development of new instrumentation systems.

Methods Employed: Collaboration with NHI-MI program office and staff of Myocardial Infarction Research Unit (MIRU) centers on systems analysis and design of monitoring and control methods. Research and experimentation on new instrumentation techniques.

Major Findings: Design and technical specifications for the analog instrumentation and data acquisition system at the Massachusetts General Hospital have been completed. A contract has been awarded to Lockheed Electronics Co. to build the system. Research has produced several promising new techniques for data handling and cardiotachometry.

Significance to Biomedical Research and the Program of the Institute: Advancements in analog instrumentation and data acquisition systems are essential to the general problem of health research and patient care.

Proposed Course of Project: Continued consultative support to the MIRU program office and to the MIRU centers with significant responsibility for technical aspects of the instrumentation system at the Massachusetts General Hospital. Research will continue on improved coronary care unit monitoring equipment.

Serial No. DRS-BEIB-6

1. Biomedical Engineering and Instrumentation Branch
2. Electrical and Electronic Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Rat Identification System

Previous Serial Number: DRS-BEIB-5 (1968)

Principal Investigator: Walter S. Friauf

Other Investigators: Horace E. Cascio, Jack S. Fuhrer, James E. Mitchell

Cooperating Unit: TD, NIMH

Man Years:

Total:	1.3
Professional:	1.0
Others:	0.3

Project Description:

Objectives: To identify individual rats out of a group of 500, at various points in a system; to operate behavorial test apparatus and record performance; to sense and record other data on rat behavior and activity.

Methods Employed: An identification system utilizing portals and passive implants has been developed. A general purpose test station has been built, featuring nine modes of operation. The mode can be selected manually, or by the computer on the basis of which individual rats are at the station.

Major Findings: Prototype construction and testing has verified that the apparatus is satisfactory.

Significance to Biomedical Research and the Program of the Institute: This system will facilitate psychological studies where individual traits are important.

Proposed Course of Project: Procurement of substantial quantities of hardware from commercial sources and use for actual studies will occur in the coming year.

Publication:

Friauf, W. S.: Rats: Their comings and goings. NTC '69 Record. National Telemetering Conference, Washington Hilton Hotel, Washington, D. C., April 22-24, 1969. Institute of Electrical and Electronic Engineers, Inc., 345 East 47th Street, New York, N. Y. 10017, pp. 34-38.

Serial No. DRS-BEIB-7

1. Biomedical Engineering and Instrumentation Branch
2. Mechanical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Prosthetic Devices for Cardiovascular Research

Previous Serial Number: DRS-BEIB-6 (1968 - Artificial Heart Assist System)

Principal Investigators: Howard D. Metz, Lester Goodman

Other Investigator: Andrew G. Morrow

Cooperating Unit: SB-NHI

Man Years:

Total:	.5
Professional:	.3
Others:	.2

Project Description:

Objectives: To design, develop, and test new devices and systems for cardiac assist applications.

Methods Employed: Applied research studies and construction pertaining to power conversion, fluid distribution, mechanical design, measurement, control and materials relevant to cardiac assistance.

Major Findings: Electrically driven roller pump ventricular assist devices operate successfully in calves for periods to 11 days. Pneumatically driven pumps can operate for more than two months. Pump configuration and materials can be produced that are practically non-thrombogenic and non-traumatic.

Significance to Biomedical Research and the Program of the Institute: Fundamental knowledge of the interaction of artificial devices with the entire physiological system is a crucial segment of biomedical research.

Proposed Course of Project: Continued refinement of design and materials with eventual chronic studies with animals leading to clinical emergency applications. Parallel investigations of effects of long-term implantation on cardiovascular, renal, and associated organ systems.

Publications:

Boretos, J. W.: Procedures for the Fabrication of Segmented Polyurethane-Polymers into Useful Biomedical Prostheses. National Institutes of Health, Division of Research Services, Biomedical Engineering and Instrumentation Branch, Bethesda, Md., 1968, 16 pp.

_____ and Pierce, W. S.: Segmented polyurethane: A new elastomer for biomedical applications. Science 158, No. 3807, 1481-1482, 1967.

_____ and _____: Segmented polyurethane: A polyether polymer. An initial evaluation for biomedical applications. J. Biomed. Mater. Res. 2: 121-130, 1968.

Pierce, W. S., Turner, Jr., M. C., Boretos, J. W., Metz, H. D., Nolan, S. P., and Morrow, A. G.: Mechanical left ventricular assistance: Experimental studies using an implantable roller pump. In Schreiner, G. E. (Ed.): Transactions of the American Society for Artificial Internal Organs, Chicago, Ill., 1967. Dr. G. E. Schreiner, Dept. of Medicine, Georgetown University Hospital, Washington, D. C., 1967, Vol. XIII, pp. 299-305

_____, _____, _____, Nolan, S. P., and Morrow, A. G.: The development and experimental evaluation of an implantable left ventricular bypass pump. Surgery (In press).

Turner, M. C., Pierce, W. S., Fogle, J. L. and Boretos, J. W.: An implantable heart assist pump system. In Jacobson, B. (Ed.): Digest of the 7th International Conference on Medical and Biological Engineering, Stockholm, Sweden, August 1967. The Organizing Committee for the 7th International Conference on Medical and Biological Engineering. Sven Brohult, Conference Chairman, The Royal Academy of Engineering Sciences, Stockholm, Sweden, p. 386.

_____, _____, Metz, H. D., and Goodman, L.: An implantable valveless heart assist pump. Paper No. 68--WA/Aut-10. Winter Annual Meeting, ASME, New York, N. Y., Dec. 1-5, 1968. Also in press, Transactions of the ASME Journal of Basic Engineering.

Serial No. DRS-BEIB-8

1. Biomedical Engineering and Instrumentation Branch
2. Mechanical Engineering Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Physical Correlates of Animal Colony Behavior

Previous Serial Number: DRS-BEIB-8 (1968)

Principal Investigators: James E. Mitchell, George A. Simon

Other Investigator: John B. Calhoun

Cooperating Unit: URBS-LP-NIMH

Man Years:

Total:	.4
Professional:	.2
Others:	.2

Project Description:

Objective: To study social structure of rat colonies.

Methods Employed: Observation and recording of all significant activity under a variety of imposed social stresses. Observation requires automated feeders, doors, waterers, activity monitors, etc.

Major Findings: Constructed prototypes of
(1) Programable door
(2) Programable waterer
(3) Unit for extended measurement on individual rats of five activities: (a) eating, (b) drinking, (c) wheel running, (d) grooming, (e) sleeping.

Significance to Biomedical Research and the Program of the Institute: Sociological studies.

Proposed Course of Project: Continue development of specific devices, particularly rat activity monitor. The nature of these monitoring devices will be established by requirements of the research project as it develops, and new channels of investigation are indicated.

Serial No. DRS-BEIB-9

1. Biomedical Engineering and Instrumentation Branch
2. Office of the Chief
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Blood CO_2 Analysis

Previous Serial Number: DRS-BEIB None

Principal Investigator: John I. Peterson

Other Investigator: Donald S. Young

Cooperating Unit: CP-CC

Man Years:

Total:	.19
Professional:	.19
Others:	.0

Project Description:

Objective: To develop rapid instrumental technic for measuring CO_2 content of blood.

Method Employed: Approach is to use infra-red absorption of CO_2 as basis of measurement.

Major Findings: Prototype system operation is adequate to justify refinements in design to achieve satisfactory and reliable performance.

Significance to Biomedical Research and the Program of the Institute: The instrument should provide a method for laboratory blood analysis that is potentially automatable, faster and more convenient than presently available technics.

Proposed Course of Project: Improvement of instrumental aspects of method and refinement of design features.

Serial No. DRS-BEIB-10

1. Biomedical Engineering and Instrumentation Branch
2. Office of the Chief
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Automated Sample Combustion

Previous Serial Number: DRS-BEIB-10 (1968)

Principal Investigator: John I. Peterson

Other Investigators: None

Cooperating Unit: LCP-NCI

Man Years:

Total:	.38
Professional:	.38
Others:	.0

Project Description:

Objective: To develop an automated combustion system for preparation of tissue samples by oxygen combustion for radiotracer scintillation analysis.

Methods Employed: Experimentation with various technics for collection of combustion products.

Major Findings: Development of a satisfactory CO_2 collection system for preparation of samples for H^3 and C^{14} analysis is complete.

Publications have been submitted, also patent application.

Significance to Biomedical Research and the Program of the Institute: Reduces time and labor involved in preparation of biological samples for radiotracer analysis.

Proposed Course of Project: Refinement of details of system to improve it in minor features.

Serial No. DRS-BEIB-11

1. Biomedical Engineering and Instrumentation Branch
2. Office of the Chief
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Utility of Lasers in Biological Research and Clinical Applications

Previous Serial Number: DRS-BEIB-11 (1968)

Principal Investigators: Grant C. Riggle, Alfred S. Ketcham

Other Investigators: Woodrow F. Stotler, Robert C. Hoye

Cooperating Unit: SB-NCI

Man Years:

Total:	.75
Professional:	.55
Others:	.20

Project Description:

Objective: To investigate laser effects on biological tissue through several methods of energy delivery.

Methods Employed: Development of techniques for delivery of laser energy in various distribution patterns to selectively effect and measure biological reaction to this form of energy.

Major Findings: Degree, color, and depth of tissue pigmentation are important factors in laser energy adsorption. Further improvement in the predictability of tumor destruction may be accomplished by proposed but as yet untested patterns of energy delivery.

Significance to Biomedical Research and the Program of the Institute: Light energy continues to offer promise as an oncolytic tool for surgery, and as a unique monochromatic light source for spectrophotometric research. New laser wavelengths are available for continued investigation and development to determine its capabilities.

Proposed Course of Project:

(1) Further investigation of the biological effects.

(2) Development of a system for investigation of laser effects on cutaneous anomalies and tumor sites.

(3) Investigation of necrotic enhancement through optical system improvements to vary energy distribution patterns.

Serial No. DRS-BEIB-12

1. Biomedical Engineering and Instrumentation Branch
2. Office of the Chief
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: Ultrasonic Induced Lesions at Intracranial Sites

Previous Serial Number: DRS-BEIB None

Principal Investigators: Grant C. Riggle and Enger H. Rosvold

Other Investigator: Marvin Snyder

Cooperating Unit: LP-M

Man Years:

Total:	.25
Professional:	.20
Others:	.05

Project Description:

Objectives: The controlled destruction of selected volumes of intracranial masses without damage to intervening tissue. Potential adaptation as a method for surgical treatment of Parkinsonian centers.

Methods Employed: Modification and development of ultrasonic coupling mediums to exposed cranial surface. Selection and control of energy patterns for creation of desired lesion volumes.

Major Findings: Temperature variations, interface coupling, and tissue density are interrelated factors which determine physical parameters at lesion sites.

Significance to Biomedical Research and the Program of the Institute: Potential method of creating intracranial lesions at selected sites for destruction of neural motor functions, without damage to mediary tissue. Applicable to treatment of Parkinson's Syndrome, and research studies relating to cortical motor control functions.

Proposed Course of Project:

(1) Evaluate accumulated data regarding observed variabilities to improve predictability of lesion site location and size.

(2) Develop methods and equipment to produce lesions accurately and precisely.

(3) Investigate other types of energy delivery (other than ultrasonics) for producing equivalent type lesions and make comparative evaluation.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1968, through June 30, 1969

CONSTRUCTION ENGINEERING BRANCH

Howard M. Biggs
Branch Chief

I. SUMMARY

The Construction Engineering Branch was organized in mid-December 1968. This is the first annual report for this Branch. Responsibility for construction which, in prior years, had been assigned to the Research Facilities Planning Branch and the Plant Engineering Branch is now the sole responsibility of the Construction Engineering Branch. Construction of large projects administered by the Public Buildings Service, General Services Administration, tapered off during the latter part of FY 1969. Construction of the General Office Building Extension, Building 31C, and the Cancer-Neuro Mental Health and Cafeteria Buildings, 35, 36, and 37, was completed during the year. With the exception of the extension of the sanitary sewer by WSSC and the completion of the installation of switchgear in Building 46, PEPCO Substation, all work under Phase I of the Master Utilities Extension program was completed. The NINDS-NICHD Experimental Facility at Sabana Seca, Puerto Rico, is substantially complete. Alterations and additions to a number of the existing buildings were effected under separate contract through normal NIH procurement channels.

II. BRANCH PROGRAMS

A. Objectives

The objective of the Construction Engineering Branch is to provide architectural and engineering support in the administration and inspection of NIH construction.

B. Current Programs

Administration, consultation, liaison, and broad general surveillance of construction projects administered by the Public Buildings Service of the General Services Administration.

Administration, supervision, and inspection of NIH construction performed under direct contract.

C. Program Progress and Accomplishments

The Construction Engineering Branch was established as an organizational entity in mid-December 1968. Programs which are now the responsibility of the Construction Engineering Branch were formerly reported under the Research Facilities Planning Branch (which has been abolished) and the

Plant Engineering Branch. Reduction in major new construction, administered by GSA, was more than offset by an increase in alteration and improvement work and smaller projects under direct contract.

NIH Construction Administered by the Public Buildings Service, GSA and Others

NINDS-NICHD Experimental Facility, Sabana Seca, Puerto Rico

This project is an experimental animal compound on land declared surplus by the U.S. Navy in Sabana Seca, Puerto Rico. At the request of the NIH, the Bureau of the Budget appropriated $200,000 for the funding of this project in September 1967. The Caribbean Division, Naval Facilities Engineering Command in San Juan, Puerto Rico, designed the project and has supervised its construction. A construction contract was awarded to Construcciones Werl, Inc. in December 1968. By June 30, 1969 this project was essentially complete. Final correction of construction defects and omissions remained to be accomplished.

Master Utilities Extensions

The Extensions to the Master Utilities distribution systems were scheduled to be installed in two major steps, Phase I and Phase II. Construction of Phase I, which includes an extension and expansion of utility systems required to supply facilities under construction or recently completed, was started late in 1964. This phase is scheduled to be completed early in FY 1970 at an approximate cost of $9,850,000. Phase II, which will provide utilities for future expansion, is still in the concept stage. The initial increment of construction under the Phase I program was completed in January 1966. Other portions of this phase have been completed since that date. These include the 9th Refrigeration Increment installed in Building 11C and completed early in 1968. Construction of a new chilled water plant, Building 34, was started in January of 1967 and was completed in the Fall of 1968, with the exception of final testing. This facility will be available for use during the Summer of 1969. Installation of a 4th Boiler and the conversion of the chilled water system for the NIH Reservation to year-round operation was started late in 1967. Work on this project was essentially complete in December of 1968. Final testing of the boiler by GSA and the Bureau of Mines was effected early in 1969. The General Services Administration accepted the work under this contract in May of 1969. In May 1968 the Potomac Electric Power Company started construction of a new NIH/PEPCO joint-use electric power substation. The building and a major portion of the equipment in the building are owned solely by PEPCO. Government owned electrical switchgear is being installed under a separate contract with the Walter C. Doe Company. Work on this contract is scheduled to be completed by August 1969. The Washington Suburban Sanitary Commission has awarded a contract for extension of the sanitary sewer from NIH in accordance with an agreement between WSSC and GSA. This will complete all construction work under Phase I.

General Office Building Extension, Building 31C

A construction contract was forwarded to the Norair Engineering Corporation in December 1966 in the amount of $5,844,000 for this project. Construction was started in January 1967 under unfavorable weather conditions which delayed excavation and foundation work. The project was originally scheduled for completion in October 1968. Initial occupancy, on an incremental basis, was effected early in February 1969. The building is substantially complete with final correction of defects and omissions remaining.

NCI-NIMH/NINDB and Cafeteria, Buildings 35, 36, and 37

A construction contract for this building complex was awarded August 27, 1965 to the Blake Construction Company at a cost of $16,782,000. The complex includes a six-story structure and basement for the National Cancer Institute, a five-story basement structure for Neurology and Mental Health and a one-story cafeteria with basement. Construction was originally scheduled for completion late in the Fall of 1967. Initial construction progress was excellent. However, final completion was delayed nearly two years for the correction of deficiencies in the cafeteria roof and for the qualification of suppliers of 31 controlled temperature rooms and three cage and rack washers. Initial occupancy of the laboratory buildings was effected in September and October 1968. Although the cafeteria was available for occupancy in November 1968, actual Government use of the cafeteria was not effected until February 1969. The General Services Administration removed the installation of the controlled temperature rooms and three cage and rack washers from the general contract and requested separate bids for these major components. Work on these contracts was completed in late Spring of 1969. Correction of defects and omissions remains to be accomplished.

NIH Construction Performed by Private Contractors under Direct Contract with NIH: Construction of most projects, estimated to require more than 350 man-hours, is performed by private contractors. Award of major projects during this fiscal year included the NEHS Interim Facility at the Research Triangle Park in North Carolina; the joint use Incinerator at Forest Glen, Maryland; work at the NIH Animal Center, Poolesville, Maryland; and major modifications to existing buildings on the NIH Reservation. Work awarded to private contractors since FY 1965 has been as follows:

Fiscal Year	No. of Contracts	Dollar Value
1965	178	$ 2,250,000
1966	152	7,735,000 1/
1967	132	2,500,000
1968	169	4,500,000
1969	149	10,330,000 2/

1/ Includes the NCI Virus Isolation Facility ($3,188,000) and the Library and Cafeteria and Wing D Additions to Building 10 ($2,752,000).

2/ Includes Incinerator Plant at Forest Glen Annex, WRAMC ($1,650,000 est.); Interim Facilities, Research Triangle Park, N.C. ($2,500,000 est.).

D. Problems

For a small and newly organized Branch, the Construction Engineering Branch has experienced normal problems of adjustment and assimilation. The projected workload for FY 1970, added to the construction workload which was carried over from FY 1969, will require an increase in the staff for supervision and inspection.

E. Program Plans

In order to improve the efficiency of the Branch, a review and the establishment of updated organizational procedures is planned. Workload assignment will be effected on a team basis involving the Branch Chief and the two Section Chiefs.

As the workload exceeds the capability of personnel to supervise and inspect, it will be necessary to negotiate construction supervision contracts with qualified consultants.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1968, through June 30, 1969

ENGINEERING DESIGN BRANCH

A. L. Perkins
Branch Chief

I. SUMMARY

The reorganization of DRS engineering activities, which was implemented in December 1968, has significant effect on the content of this annual report. This report will include those programs invested in the Design and Development Sections of the former Research Facilities Planning Branch and the former Engineering Design Section of the Plant Engineering Branch from July 1, 1968, to the December date of the reorganization. Also included in this report will be the functions of the Engineering Design Branch from December 18, 1968, until June 30, 1969.

The current EDB program includes more than fourteen major projects in various stages of planning and design. Also included are design for alterations, plant maintenance and repair and improvements to existing NIH facilities. In addition, a limited amount of development-type work was done.

II. BRANCH PROGRAMS

A. Objectives

This branch provides the architectural and engineering support required for new NIH facilities and improvements, major repairs and alterations of existing facilities. These efforts include in-house design, direct contract with A/E firms, or consultation, liaison and review functions for projects contracted and administered by the Public Buildings Service of GSA; assistance with presentation of design programs to reviewing authorities such as the National Capital Planning Commission and The Commission of Fine Arts; developing technical guides and standards; and providing consulting services to other governmental and non-governmental organizations upon request.

B. Current Programs

This Branch is primarily responsible for assuring that the designed new construction, and alterations and improvements to existing NIH facilities, provide for the program needs of NIH research scientists. A staff of professional engineers and architects renders consulting service and provides coordination between contract engineers and architects, PBS (GSA), NIH research staff members for whom facilities are being provided, and other concerned branches of the Division of Research Services.

The development program is one of technical assistance and is directed toward improving the functional aspects of facilities presently under design, as well as contributing standards, recommendations, and solutions to operational problems encountered in existing NIH facilities.

Members of the engineering staff are frequently called upon to confer with visiting research scientists and engineers on current concepts, techniques, and practices in the design and construction of biomedical research facilities. These visitors represent a broad spectrum of national and international medical research activities, both government and private.

C. Progress and Accomplishments (for a summary of all major design projects, see attached Table I)

Multilevel Parking Facility for NCI-NIMH/NINDS Buildings

Planning funds for this project to provide a multilevel parking structure for 825 cars were appropriated in FY 1966. The POR for this facility was forwarded in March 1966, through channels, to the BOB. In September 1966, the BOB approved the POR after requesting that NIH make a comprehensive study of various aspects of parking, including methods of operating a multilevel parking garage. This study was completed and a report forwarded, through channels, to the BOB in April 1967. In November 1966, GSA negotiated a design contract with the A/E firm which had designed the NCI-NIMH/NINDS Building complex. Conceptual pre-diagrammatic sketches were approved on July 11, 1967. The tentative sketches were approved on November 13, 1967; and the intermediate working drawings were approved on April 8, 1968. Complete Working Drawings were approved on July 22, 1968; and the Final Working Drawings were approved on December 6, 1968. The project was advertised for construction bids on March 24, 1969; and bids were opened on May 13, 1969. Time for construction is estimated to be twelve months.

NIH Animal Center, Phase 1A

This project includes a general laboratory building and an animal behavior laboratory for the NIMH, and a primate building for Laboratory Aids Branch, DRS. After approval of revised tentative sketches in August 1965, this project was delayed by the A/E's requests, first, for an additional fee and later, for the termination of his contract. Each of these requests was denied by GSA. Upon official notification in December 1965 to proceed with design, the A/E resumed work. Intermediate working drawings were received by GSA in April 1966. However, the GSA cost estimate, based on the intermediate working drawing submission exceeded available funds by $178,000. NIH, GSA, and the A/E decided that construction costs could be substantially reduced by relocating the Primate Building. Since this requirement constituted a change in scope of the A/E's contract, the A/E requested an additional fee. At this time the design program was further delayed while the NIH request for $25,000 additional planning funds was approved by the BOB and the funds transferred to GSA. The A/E resumed work in October 1967 and submitted complete working drawings in late January 1968. The design of this project was completed in December 1968. DHEW authorized advertising for construction; GSA scheduled this project to be advertised April 11, 1969, with bid opening May 20, 1969. Time for construction is estimated to be fifteen months.

NIH Animal Center, Phase II

This project includes an agricultural management building, animal production facility, a third residence, and necessary supporting utilities and grounds

improvements. The POR was approved by NIH and forwarded, through channels, to the BOB in November 1965. The BOB delayed approval of the POR and deferred action on a request for apportionment of the planning funds pending receipt and evaluation of additional justification for the project. Late in April 1967 the BOB gave informal approval to proceed with this project. The POR was revised in accordance with BOB approval and forwarded to GSA in December 1967. A design contract was negotiated by GSA, Region 3, in March 1968, with Lucius R. White, Jr., and Edward C. White in a joint-venture with Sanders & Bicksler. Design shall be completed in March 1970. Construction funds have not been appropriated. Funding may be considered for FY 1971. Time for construction is estimated to be two years.

Multilevel Parking Facility for Building 31

This $1,600,000 project is for a 650-car parking structure--first phase of an ultimate 1,150-car parking facility--to serve the occupants of Building 31. The project is being designed by the joint-venture of Keyes, Lethbridge & Condon and Carroll, Grisdale & Van Alen, the same firms that designed Building 31-C. Diagrammatic sketches were submitted in June 1967, and the project was approved by The Commission of Fine Arts and by the National Capital Planning Commission in July 1967. Tentative sketches were submitted in November 1967. The NIH comments were forwarded to GSA in December 1967; however, the GSA review indicated a $795,000 deficit in the project costs. Preliminary soil boring tests which were completed in January 1968 also indicated that, because of underground water, extensive redesign might be necessary. Subsequent studies by the A/E and GSA revealed a reduction in the seriousness of the groundwater problem. The budget deficit was resolved in July 1968, and the A/E was instructed to proceed with Working Drawings on the basis of (1) reducing the structure to a capacity of approximately 620 parking spaces, and (2) using additive Alternate Bid Items. Final Working Drawings were submitted in April 1969.

Construction funds for the project totalling $1,489,000 were appropriated in FY 1967. In FY 1969 these funds were reprogrammed to support the construction of the Environmental Laboratory in Morgantown, West Virginia. Since the construction funds for the First Phase Multilevel Parking Facility were reprogrammed by DHEW, and the Bureau of the Budget approved the Program of Requirements and released the planning funds in January 1969 for the Second Phase of the Multilevel Parking Facility for Building 31, NIH proposed that the two projects be combined so that construction bids can be taken together when construction funds become available. Design for the Second Phase is expected to start early in FY 1970 and be completed by July 1970. The combined facility will require a construction period of eighteen months.

NINDS/NICHD Research Facility, Puerto Rico

The A/E for design of this project is the joint-venture of Isadore & Zachary Rosenfield, Fred S. Dubin & Associates, and Efrain E. Perez-Chanis. Diagrammat sketches were submitted in August 1966 but were not approved due to an estimate budget deficit of $187,000. Revised diagrammatic sketches were resubmitted in December 1966 and were approved by GSA in January 1967.

At the completion of FY 1967, the project's estimated construction cost was over its $1,912,000 budget by $300,000, due to a projected 14 percent per year construction cost escalation in San Juan, Puerto Rico. After reviews and consultation with the two client Institutes and DRS, it was agreed to reduce the size of the planned building rather than start a complete redesign. Recommendations for space reductions were forwarded to GSA in August 1967. The design schedule was extended accordingly; revised tentative sketches were submitted by the A/E in February 1968, and approved by NIH in March 1968. (In early January 1968 responsibility for design supervision was transferred from the Central Office of GSA to Region 2 of GSA.) The revised tentative sketches were formally approved by GSA in April 1968.

Intermediate working drawings were submitted in July 1968 and approved by GSA in September 1968. Final working drawings were submitted in March 1969. Funds for construction were appropriated in FY 1963 and FY 1966. Time for construction is estimated to be twenty-one months.

Combined Service Facility and Warehouse

Notice to proceed with the design of the Phase I Warehouse was given to the selected A/E firm by GSA in May 1965. In the diagrammatic submission of June 1965, the A/E's construction cost estimate was $120,000 higher than the $670,000 sum available for the award of a construction contract. However, GSA estimated at this stage that the facility could be constructed within available funds. Because GSA failed to give the A/E a notice to proceed with the development of a master plan for the warehouse area until October 1965, tentative sketches were not received until December 1965. The A/E's cost estimate at the tentative stage was $1,099,536, approximately $430,000 above the funds available for the construction contract award. Numerous studies were made by RFPB, GSA, and the A/E in an effort to reduce the cost of the project. All work on the project was deferred in January 1966, pending completion of a Master Site Plan for the southern portion of the NIH reservation, a Materials Handling Study (related to use of the existing transportation tunnel for new warehouse needs), and an Incinerator Site Study. As a result of site plan studies the original site west of Building 14 was abandoned, and a new site south of Building 14 was identified. This new site received the approval of the National Capital Planning Commission. A new POR was then prepared for the Phase I Warehouse and the Combined Service Facility to be accomplished as a single project. This POR was forwarded to the Division of General Services, DHEW, for review and approval on September 4, 1968. On April 17, 1969, a meeting was held at DHEW to discuss the contents of the POR, which resulted in the decision to rewrite the document. Design should be completed in July 1970. Construction funds have not been appropriated. Funding may be considered for FY 1971. Time for construction is estimated to be fifteen months.

Child Research Center (NIMH)

The original design for this facility was stopped at the completion of tentative sketches. In November 1965, progress beyond this stage was delayed pending a resolution to the community-sponsored recommendations for the extension of Woodmont Avenue through a portion of the NIH reservation to Wisconsin Avenue. This extension necessitated a new site for the CRC facility. Accord-

ingly, in July 1966, NIH requested GSA to proceed with the design of the Center on a site in the southwest corner of the NIH reservation. Negotiations between the A/E firm, Johannes & Murray & Associates, and GSA delayed the initiation of the new design contract until December 1966. A revised site plan was submitted by the A/E in January 1967. Significant delays were incurred in obtaining the National Capital Planning Commission's approval of the site layout plan. The plan was finally accepted. In April 1967, at the request of GSA, DHEW reluctantly agreed to budget for construction funds for the project which originally were in a GSA appropriation. Design should be completed June 1969. Construction funds have not been appropriated. Funding may be considered for FY 1971. Time for construction is estimated to be eighteen months.

NICHD Research Facility

The architectural firm of The Architects Collaborative, Cambridge, Mass., is the A/E for this project. Diagrammatic Sketches were submitted in January 1968 and were approved by the National Capital Planning Commission, The Commission of Fine Arts, and by GSA in March 1968. Tentative Sketches were submitted in June 1968; approved by NIH in July 1968 and by GSA in August 1968. Intermediate working drawings were submitted in November 1968. As detailed scientific program plans developed and new members of the NICHD Intramural Scientific staff were appointed, various changes to the design were requested. These changes were negotiated with the A/E, and the design progress schedule was revised accordingly. Design should be completed September 1969. Construction funds have not been appropriated. Funding may be considered for FY 1971. Time for construction is estimated to be twenty-six months.

Master Utilities Extension

This program was divided into two major phases: Phase I included extension and expansion of utility systems required to supply those new facilities under construction or recently completed; and Phase II, which will provide utilities for buildings presently under design and in planning. Phase I design has been completed, and construction is essentially completed.

The Phase II project will provide plant capacity and distribution lines for the Fogarty Center, Combined Service Facility, the NICHD Building, NLM Extension and the Child Research Center. Some additional miscellaneous master utility distribution lines will also be provided. The POR for this project should be ready for submission, through channels, early in FY 1970. Design should be completed March 1971. Construction funds have not been appropriated. Funding may be considered for FY 1971. Time for construction is estimated to be eighteen months.

National Environmental Health Sciences Center (NEHSC)

Planning funds for this project were appropriated in FY 1961 and FY 1965. In August 1966, responsibility for the planning, design and construction of the NEHSC was transferred to NIH. These facilities, as well as the National Center for Air Pollution Control, are to be constructed on the 509-acre site located at Research Triangle Park, North Carolina. The POR for the Master

Site Plan of the 509-acre site was prepared by the Division of Buildings and Facilities, OSG, PHS. In May 1967, PHS forwarded this POR, through channels, to the BOB for approval. BOB approved the Master Site Plan POR in February 1968.

An A/E contract for the Master Site Plan was awarded to the joint venture of A. G. O'Dell and Smith, Hinchman, Grylls and Associates in June 1968. The Master Plan should be completed by the second quarter of FY 1970. A POR for permanent facilities for NEHSC and another POR for common-use facilities which have been assigned to the National Institute of Environmental Health Sciences should be completed by the third quarter of FY 1970, respectively. Design of permanent construction should start about May 1970 assuming planning funds are apportioned.

John E. Fogarty International Center for Advanced Study in the Health Sciences

Planning funds were appropriated in FY 1968 and apportioned for planning in October 1968. The POR was begun in October 1967, submitted to the Director, NIH, in April 1968, and approved by the BOB with the apportionment for planning. The BOB approval reduced the level of proposed construction costs from $6,475,000 to $5,000,000, which necessitated the elimination of the center's proposed multilevel parking until it can be re-evaluated for the possible incorporation with other parking requirements in the area. Design should be completed June 1970. Construction funds have not been appropriated. Funding may be considered for FY 1971. Time for construction is estimated to be twenty-four months.

NIH Incinerator Facility

Planning funds were appropriated in 1967 and construction funds in 1968 for a municipal-type incinerator plant, rated at an approximate burning capacity of 175 tons per day.

At the request of the Bureau of the Budget, a consulting engineering firm was engaged to study the feasibility of constructing an incinerator plant which would handle the combined wastes from the National Institutes of Health, the National Naval Medical Center, and the Walter Reed Army Medical Center.

The final report on the incinerator study proposed an incinerator facility for the joint use of NIH, NNMC, and WRAMC to be located at the Walter Reed Forest Glen Annex. The estimated construction cost was reduced from $3,270,000 to $2,080,000 based on information furnished by the engineering report.

NIH will provide funds for the entire cost of the incinerator planning and construction, including the cost of alterations necessary on the NIH reservation for revised handling and collection of wastes to conform with the proposed new incinerator operation. NIH has obtained a use permit for the land from the Department of the Army. The completed facility will be operated by NIH.

A design contract for the preparation of plans and specifications was awarded to the firm of Metcalf and Eddy in June 1968. The preliminary design submission was made in October 1968 and approved by NIH and NCPC in November 1968.

A revised plan was approved by The Commission of Fine Arts in February 1969. Design should be completed May 1969. Funds for construction were appropriated in FY 1968. Time for construction is estimated to be twenty-six months.

Interim Facilities, Research Triangle Park, N.C.

This second phase of interim facilities for NIEHS includes a laboratory building, an aerotoxicology building, an experimental animal building, and a central utilities plant. The structures are to be constructed under a build-lease contract. The design commenced in January 1968 and was completed in April 1969. A construction contract award is anticipated prior to June 30. Time for construction is estimated to be twenty-one months.

Alterations, Plant Maintenance and Repair & Improvements

In addition to the major projects listed above, considerable effort was expended in the design of alterations, plant maintenance, repairs and improvements to the existing NIH facilities. A summary of this work for which design was completed during the report period follows: (projected through June 1969):

Type	No. Completed	Actual or Estimated Cost of Construction
Professional Services Contract	39	$5,894,500
Staff Projects for Contract Work	92	3,176,409
Staff Projects for Shop Work	78	
Engineering Studies or Surveys	13	
		$9,070,909

A few of the more important projects are listed below:

Alterations:	
Renovate Computer Area, Bldg. 12A	$ 605,000
Remodel Central Sterile Supply, CC	100,000
Install Virology Laboratory, Bldg. 36	450,000
Alter First Floor, Bldg. 9	50,000
Temporary Infirmary, Lorton, Virginia	100,000
Plant Maintenance:	
Masonry Repairs, CC	$ 125,000
Mortar in Spandrel Facings, Bldg. 31	20,000
R&I and New Construction:	
Interim Facilities, Research Triangle Park, N.C.	$2,500,000
New Incinerator Plant, Forest Glen	2,100,000
Temporary Rodent Facility, NIHAC	120,000
Construct Temporary Parking, Reservation	60,000

Development and Collaborative Projects

Program studies, the majority of which are of short duration, are reported and distributed internally to interested NIH organizations and/or published

in trade journals. Requests from extramural activities for available information are also filled. Limited research and development contracts continue to be an effective means for improving the quality of work and conserving manpower and money. Such contracts also increase program flexibility and provide detailed specialization where required.

The vital importance of laboratory animals to health research has accentuated the need for better quality animals. In recognition of this need, a research and development program to improve animal care and facilities has been in progress for several years. The studies include: (a) the development of caging systems, particularly for the NIH Animal Center, Phase 1A and Phase II; and (b) the development of the automated equipment and care procedures with emphasis on watering, feeding, and cage cleaning techniques.

EDB also provides technical assistance and advice to other NIH groups in preparing design guidelines, criteria, specifications, and standards for equipment and facilities.

As a means of stimulating new approaches and introducing new concepts, several visits to other laboratory and animal facilities were made. Information from private institutions, as well as other government facilities, has served to foster novel ideas and solutions to operational, design, and construction problems here at the NIH.

Some reports typical of work done in the research and development area include the following:

1. Effect of Disposables on Building Facilities
2. Controlled Environmental Room Guideline Specification
3. Cage and Rack Washer Specification
4. Tunnel (Conveyor) Washer Specification
5. Laboratory Sealants

D. Problems

Design progress on new buildings and facilities has been hindered by budget reductions and reprogramming of appropriated funds to support other DHEW activities. Funded projects typically have not progressed according to schedule, with delays developing at each phase from initiation of the Program of Requirements through construction. These delays are most often the result of (1) review and approval by groups outside NIH, (2) unrealistic time schedules, (3) substantial program changes, (4) funding deficits, and (5) in-house manpower limitations.

Design progress on alterations, repairs and improvement projects has been meeting all the more important needs in a timely manner. However, these efforts have been handicapped to a significant degree by (1) delays in decisions on program alterations which crowd too much of the work into the last two quarters of the fiscal year, and (2) funding limits on repair and improvement projects. The former is the more significant problem in that it creates a considerable imbalance in the workload scheduling and often results in design periods which are too limited for thorough development.

E. Program Plans

The reorganization of engineering functions of DRS provides an excellent opportunity to make the most effective use of staff capability in meeting work commitments, identifying standards and criteria, providing training, recruitment and career development, etc. The principal goal of the EDB is to vigorously pursue this opportunity. More specifically:

1. Work scheduling procedures are being developed which will permit greater involvement of the I/D's in the determination of design schedules and the allocation of manpower; also, a more even distribution of work through the year to reduce "end of the fiscal year" problems will be sought.

2. The preparation of program of requirements, the furnishing of technical criteria to consultants, and the review of their efforts can now be more consistently and efficiently achieved.

3. The EDB plans to undertake a training program which will place emphasis on in-service training; it will concentrate on developing standards on design problems of a recurring nature and on the consolidation and organization of resource materials, standards, and design criteria to promote efficient preparation of Programs of Requirements and review of projects in the design stage.

TABLE I - EDB - FY 1969 Program of Authorized Design Projects

Project	Design Completion Date	Const. Compl. Date	Const. Cost	Planning Cost	Total Project Cost	A/E Designer
NCI-NIMH/NINDS Multi-level Parking Facility	12/68	7/70	$1,985,000	$125,000	$2,110,000	Smith, Hinchman & Grylls Assoc., Inc.
NIH Animal Center Phase 1A	12/68	10/70	1,889,000	126,000	2,015,000	Heery and Heery
NIH Animal Center Phase II	12/69	3/72	4,822,000	440,000	5,262,000	White & White with Sanders & Bicksler
MLP, Bldg. 31 Phases I and II	7/70	9/72	3,640,000	211,000	3,851,000	(Keyes, Lethbridge & Condon) and (Carroll, Grisdale & Van Alen)
NINDS/NICHD Research Facility, P.R.	4/69	1/71	2,172,000	148,000	2,320,000	Isadore and Zachary Rosenfield, Fred S. Dubin Assoc., and Efrain E. Perez-Chanis
Combined Service Facility & Warehouse	9/70	12/72	3,400,000	380,000	3,780,000	Not selected.
Child Research Ctr. (NIMH)	5/69	5/72	1,285,000	156,000	1,441,000	Johannes and Murray
NICHD Research Facility	9/69	3/73	10,517,000	700,000	11,217,000	The Architects Collaborative
Nat. Environ. Health Sciences Ctr., N.C.	1/72	10/74	37,860,000	3,420,000	41,280,000	Not selected.
John E. Fogarty Center	6/70	9/72	5,000,000	500,000	5,500,000	Hellmuth, Obata and Kassabaum
Incinerator Plant Forest Glen	5/69	7/71	2,100,000	125,000	2,225,000	Metcalf & Eddy

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities — July 1, 1968, through June 30, 1969

ENVIRONMENTAL SERVICES BRANCH — Vinson R. Oviatt, Chief

I. SUMMARY

The Branch was reorganized on the basis of functional programs one year ago. In the past year there has been demonstrated improved coordination of efforts and increased effectiveness in accomplishment of the Branch objective. The efficiency gained through reorganization was offset by the loss of five professional personnel, decreasing the staff from 32 to 27 persons.

Increased emphasis was placed on better programming of activities. Those activities providing a larger overall contribution to the NIH environment received first attention. Because of the time required for short-term work items of a trouble-shooting nature, coupled with personnel shortages, all of the planned surveillance work was not accomplished.

As a major part of the biological hazards control activities, assistance was given to NCI-DOW in evaluating Building 41 construction details, testing various barrier components of the building and training support service personnel who will occupy the building. This experience will provide the Branch with a greater staff competency for giving up-to-date technical assistance on biohazards activities to the Institutes and Divisions.

Policy and Procedure Memoranda No. 16, which designates responsibility for biohazards, and identifies them with a universally recognized sign, has been implemented by the Branch.

Better hood systems have been developed by industry to protect the environment of the researcher and his work. An important function of the environmental control program is to evaluate the new equipment for adequacy and to make periodic performance checks. Most common discrepancies occur with failure of the integrity of the filter system and inadequate air flow.

Morpholine, a toxic additive used to control corrosion in steam condensate lines was found in excessive amounts in steam supplied to critical areas on the reservation. Special tests were developed so plant engineers could control the proper levels in the system. Where a zero tolerance in food and medication is desired, kitchen and hospital equipment is being modified so that no direct exposure to steam is possible.

To increase the Branch capability in environmental microbiology, a virologist was added to the staff. The virology laboratory is fully equipped for operation

In the last year more emphasis was placed on accomplishment of Branch objectives by training. Because of immediate needs, most of the efforts were directed to the biological control program. Initial training efforts were made with medical support personnel, laboratory technicians, housekeepers and animal caretakers.

II. BRANCH PROGRAMS

A. Objective

The objective of the Environmental Services Branch is to insure that a healthful and otherwise satisfactory environment is maintained at NIH and its field stations.

B. Current Programs

Attainment of the Branch objective was approached through four closely coordinated functional program areas.

1. Hospital sanitation

2. Control of biological hazards

3. Industrial hygiene

4. General sanitation and sanitary engineering

The hospital sanitation program dealt with the environmental aspects of the Clinical Center's infection control effort and, in addition, gave assistance to NCI's clinical care program at the USPHS Hospital in Baltimore. The only real change from last year's program was the amount of service that could be provided because of a lack of personnel. In the Clinical Center all operating rooms were surveyed once. Routine surveys were carried out on six nursing units where the potential for cross infection is greatest. Regular checks were also made of the formula room, central sterile supply, blood bank, laundry, and similar critical areas.

Microbiological examination of the formula room and dairy products and support of the Life Island project were maintained. Some studies to upgrade the quality of the environment were performed. The use of rodac plates with egg yolk agar, blood agar, and other types of special media have shown these to be very valuable for rapid demonstration of the presence or absence of Staphylococci in patient-care areas. Laboratory support is furnished to the Division of Environmental Sanitation Control, Clinical Center, on studies to determine the effectiveness of various cleaning procedures.

The program for control of biological hazards covers all NIH facilities at Bethesda and in the field, with the exception of the patient-care areas of the Clinical Center. Three approaches are followed in dealing with potentially hazardous laboratory and animal room areas. These are: (1) regular surveillance of Institute programs, control equipment and facilities; (2) training of laboratory technicians and animal caretakers; and (3) development on a

case-by-case basis of laboratory arrangements needed to protect the investigator and the public.

The industrial hygiene program deals with potentially harmful, non-living or inert contaminants. The major workload results from toxic fumes and potentially harmful particulates. Investigations involving carcinogens and energy sources are typical industrial hygiene activities. Other factors affecting comfort, and therefore employee efficiency, which receive attention are temperature extremes, odors, noxious fumes, air pollution, and illumination.

The general sanitation and sanitary engineering program includes a broad range of traditional and special environmental health activities. Food sanitation, water supply, solid and liquid waste disposal, housekeeping practices, animal facilities sanitation, and cage and glassware washing operations are examples. Monitoring of high purity water is an important function which places a sizable demand on this program. All central distilled water supplies are checked weekly for specific resistance, except in Building 10, where the supply is checked daily. Analysis of the copper content of all distilled water supplies at Bethesda and the field stations is performed quarterly.

C. Program Progress and Accomplishments

More effort was put into planning for the prevention of long-range problems. As in the past, short-term work items of a trouble-shooting nature required considerable staff time.

The Branch has always devoted considerable time to review of plans for new facilities. New construction under design in 1969 included several projects involving environmental control problems to which the special skills available in the Branch were applied to good advantage. The Interim Facilities for the NIEHS in North Carolina will be used for air pollution studies which require very high purity air for ventilation. The Tri-Service Incinerator is to be located close to a residential area where no air or water pollution possibilities can be tolerated. The new laboratory building for the NICHD combines behavioral with chemical and microbiological laboratories which must not be permitted to adversely affect each other.

Until his transfer in December, an engineer was assigned to the Building 41 project on a half-time basis as liaison between the NCI scientific staff and DRS construction engineers. Since the first of the year a CO-2 engineer has been assigned almost full-time to assist with test evaluations of the Building 41 exhaust system, liquid waste system, containment equipment, and other components of the barrier systems.

The use of laminar flow hoods for the protection of research experiments has increased greatly over the past year. To assure satisfactory operation of thi equipment, the program initiated in 1967 for dioctyle phthalate testing of new filters was continued. When filters are changed, the units are rechecked.

High efficiency filters are also widely used in building exhaust systems and biological safety cabinets to trap potentially hazardous organisms. To mainta the integrity of the filter, a program is carried out on a visual inspection

every six months for physical damage, a rough efficiency check annually, and a careful check every two years, or when the filter is changed.

It was reported last year that an initial survey of approximately 800 fume hoods at Bethesda and the Gerontology Building was completed which established the performance level of each hood. Because major space changes continually change hood locations and functional status, annual checks are made. At the writing of this report, about one-half of these checks have been completed. During this process, limited evaluation is also given to the control of hazardous chemicals.

One means of controlling microbiological contamination in research laboratories is the use of ultra-violet lights. The method of installation is reviewed and a semi-annual survey is conducted to measure the UV intensity for effectiveness and proper cleaning of bulbs. A 10-15 percent defect rate was shown by the survey.

A routine function of the biohazards program is decontamination. Usually, this is on a small-scale such as a room or safety cabinet. In connection with the transfer of equipment and materials from Building 6 to Buildings 37 and 41, a large-scale decontamination process has started. This process will afford safety to personnel and research animals and destroy extraneous biological contaminants that might otherwise be transported into the new laboratory space.

An important part of any biohazard control program is a means of identifying potentially hazardous areas. A program for this purpose has been initiated. A symbol, similar in use to the radiation safety symbol, has been recognized nationally and approved by the Director of NIH. To implement proper use of the biohazards symbol at NIH, a Policy & Procedure Memoranda No. 16 was established. The PPM provides for an 8" x 10" sign, with the symbol affixed. This sign contains information describing the hazard and a clearance procedure for admittance to the area. ESB has been designated in the PPM to distribute the signs and to evaluate the hazard and containment needs with the investigator.

Until recently, laboratory glassware was crushed to reduce the volume and render it unattractive for salvage. An earlier study had shown that laboratory glassware was not sterilized in the deep NIH autoclave pan at the standard 30-minute cycle because of air pockets. All I/D's were notified to increase the autoclave time to one hour. In the meantime, an extensive investigation was made of PEB's glass-crushing operation from the standpoint of a biological hazard to the operating personnel. Air samples showed extremely high concentrations of bacteria. The operation was discontinued and a private contract let to haul the disposable glassware in a safe and sanitary manner to a landfill for burial. Assistance was received from the Employee Health Service, Clinical Center; Protection and Safety Management Branch, OD; and Plant Engineering Branch, DRS.

The DRS program initiated last year for supporting the Institutes in the animal care field was continued. A staff member from LAB and ESB evaluate animal facilities for conformance with the accreditation standards on sanitation, animal husbandry, and facilities which have been established by

the American Association for Laboratory Animal Care. Inspections were carried out in NIAID and NIAMD.

The frequency of Pseudomonas infections are second only to Staph aureus infections in the Clinical Center. A specific method of identifying and separating Pseudomonas strains will be important to the epidemiological study of this infection. A phage typing method was reported earlier by ESB. In the past year a comprehensive study of pyocin typing of P. aeruginosa was completed For the strains sensitive to this test, over 90 percent are typable. Since thi is a more specific test than phage typing, it will be used to process cultures collected at weekly intervals.

Morpholine, a toxic additive used to prevent corrosion in steam condensate return lines, was noted to be present in excessive amounts in steam supplied to many areas of the reservation. Following a study to determine the hazards, special tests were developed so plant engineers could determine the levels in the system and add only the required amount. A continuous modulating feed system has been adapted to replace the batch system. This system permits use of minimum quantities at all times. Kitchen and hospital equipment is being modified so that no direct exposure of food and medication is possible.

A simple test was needed to determine if the hospital housekeeping staff were routinely adding sufficient amounts of phenolic disinfectant to the mop water. Such a chemical test has been developed and submitted for publication and possible patent rights.

The Branch has long recognized a need to expand its training activities, and considerable progress has been made with the addition of a training officer to the staff. A training course in proper handling of infectious materials with safety pipettes was given to 25 technicians in NCI. Other types of training were provided for: animal caretakers, housekeepers, glassware and cage washer operators who will occupy Building 41; the Insect and Rodent controllers and Grounds Maintenance crews in the safe handling of toxic materials; and professional nurses and nursing aides entering on duty in the Clinical Center.

Another aspect of training is the intern program for hospital-trained sanitarians. A Ph.D. candidate at the University of Michigan School of Public Health is presently serving a 6-month period as "guest worker" in ESB.

To increase the Branch capability in environmental microbiology, a virology unit was added. Remodeling is complete and the unit is now fully equipped for operation.

Air pollution spot checks are made on a monthly basis throughout the year. The use of low sulphur oil in the NIH power plant is paying dividends in much lower atmospheric SO_2 concentration.

D. Problems

Many internal problems have been solved with the organizational changes, which reduced the number of supervisory levels and staffed each section to carry out

specific functional programs.

A major problem affecting Branch accomplishment of planned activities was the higher-than-usual loss of personnel. This happened just prior to the administrative "freeze" which reduced work force.

The hospital sanitation program was reduced from two staff persons at the start of FY 1969 to zero in November. One of these positions was filled in February 1969, but considering the time required for this person to become fully productive, it is estimated that one man-year was lost to this program. The biohazard and industrial hygiene programs are also inadequately staffed to keep up with the growth of activity at NIH.

Some progress was made toward reduction of the number of two-year career development rotational assignments by replacing positions vacated with more experienced personnel. The effect of short-term notice on priority hiring quotes makes it extremely difficult to recruit experienced persons.

A better working relationship has developed with other organizational groups involved in environmental health activities by mutually agreeing on respective roles. Problems which do arise are alleviated by more frequent contact and exchange of ideas. Further contact should minimize the problems in the future and help to strengthen our mutual efforts.

Problems in biohazards control have been identified in the past and remain generally unresolved. These can be catagorized as follows: (1) there is agreement on the action which should be taken, but nothing is done because the scientist resists using containment equipment or protective devices; (2) there are questions raised as to whether ESB has correctly assessed the risk; (3) there is indefinite knowledge of future Institute programs that may require specialized containment facilities.

It is anticipated that some progress will be made on items 1 and 2 above by the following means: (1a) Use of vertical laminar flow hoods should help. Evaluation of the vertical laminar flow hood has demonstrated that moderately hazardous work can be safely performed in this equipment. Since the equipment design is less restrictive to the investigator, it should be more acceptable; (2a) The addition of a virologist to the ESB staff should improve the Branch communication with the scientists and provide a better understanding of the virus research problems.

E. Program Plans

The one year of experience operating under the change in organization structure has resulted in improved coordination of program activities, better communication between the sections, and an enthusiastic staff training effort. There is still a need for improvement in these areas for maximum utilization of personnel. This should not require any change in objectives of the Branch.

As a means for improvement of the environmental aspects of the hospital and laboratories, increased emphasis will be place on training of plant operations, personnel, animal caretakers, and laboratory technicians. A particular need

exists for training the above mentioned groups in connection with the biological safety program.

Development activities will continue to receive attention because of the long-range value that can be gained. As in the past year, the main emphasis will be on development of laboratory and field methods which are used for evaluating the environment, new products, and new equipment.

A virology laboratory which will give primary support to the biological contr activities is now in operation. This program was delayed almost one year due to a holdup in remodeling and equipping the laboratory. A program of broad scope will be developed with initial emphasis on methods for collecting viruses from the environment.

It is expected that all areas working with hazardous biological agents will be properly identified with a biohazard sign and a clearance procedure established for the admittance of support personnel. A similar activity which will receive priority, is the evaluation of problems associated with carcinogenic chemicals in laboratories. Control measures will be developed when needed.

An attempt will be made to relieve the hospital sanitarian from many of the routine monitoring activities. This should provide time for him to examine more difficult environmental problems. A well-supervised technician can perform the routine tasks. It is hoped that a position slot will be availabl to permit the establishment of this position.

A major time-consuming activity is the field testing of the filters in new clean benches prior to acceptance by NIH. Arrangements are underway to train personnel to perform this activity in the Quality Control Unit of Supply Management Branch. This group would also be responsible for checking this equipment during the warranty period.

F. Publications

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Farmer, J. J., III, and Eagon, R. G.: Aldohexuronic Acid Catabolism of a Soil Aeromonas, Journal of Bacteriology, January 1969.

Fox, D. G.: An Empirical Study of the Application of a Horizontal Uni-Directional Airflow System for a Hospital Operating Room, Public Health Monograph, (in press).

Karamian, N. A. and Musachio, M. B.: Rapid Method for Morpholine Analysis in Steam and Industrial Water, Journal of Environmental Health, Vol.31: pp. 58-60, November, 1968.

Wilkinson, T. K.: Air Contamination and Lasers, AMA Archives of Environmenta Health, 18: 443-447, March 1969.

Herman, L. G.: Principles and Methods of Sterilization in the Health Sciences (review). American Society for Microbiology News, vol. 35 pp.19-20, April 1969. Perkins, J. J. (author) ed. 2: Springfield, Ill. Charles C. Thomas, 1969, 560 pp.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities — July 1, 1968, through June 30, 1969

LABORATORY AIDS BRANCH — Dr. Anton M. Allen, Acting Chief

I. SUMMARY

The Laboratory Aids Branch constitutes a basic central research resource of fundamental importance for the intramural research programs of the National Institutes of Health. Its responsibilities include producing genetically characterized research animals and animals of known microbial flora and health status; procuring, conditioning, and issuing animals obtained from outside sources; animal surgery, X-ray, and recovery; animal disease diagnosis and control; maintaining animals and collecting biological specimens; preparing bacteriologic and tissue culture media, tissue culture cells, and laboratory glassware; and providing professional services relative to anima procurement, health, care, and husbandry. Additionally, the Branch is responsible for conducting studies necessary to advancing the definition of experimental animals, their health, and optimum maintenance.

Emphasis was placed upon data processing of production and animal issue information in order to achieve greater efficiency in the utilization of limited production facilities. Efforts were made also to bring the price c animals more in line with cost of production of animals of different weight and ages at issue. Efforts to improve the quality of all animals furnished to intramural research programs were continued and intensified. For the second successive year, rodent and rabbit production colonies experienced n major outbreaks of disease. A program was initiated to establish rat colonies in barrier environment to increase the security of inbred foundati colonies and permit production of rats free of chronic respiratory disease.

With the establishment of a nutrition laboratory, more intensive research c animal foods was initiated and food specifications were revised, consistent with newer knowledge of the nutritional requirements of laboratory animals.

The colony of blood donor dogs was expanded and has continued to reduce significantly the number of dogs required for research purposes at NIH. Th furnishing of blood reduced the needs for dogs about 1300 animals below las year's requirement.

Dr. Raymond D. Zinn, former Chief of Laboratory Aids Branch, was transferre and Dr. Anton M. Allen was appointed the Acting Chief.

II. BRANCH PROGRAMS

Production of Laboratory Rodents and Rabbits

A. Objectives

To support biomedical research at NIH by providing quality rodents and rabbits. To maintain the genetic integrity of inbred and non-inbred strains. To advance the definition of what constitutes optimal experimental rodents and rabbits, and animal care practices. To provide nutritional and environmental conditions that enhance the quality of animals produced. To apply germfree and specific pathogen-free technology in the production of animals required for intramural research and to enhance the health status of production and genetic colonies. To advance germfree and SPF technology sufficiently to permit maintenance of a greater variety of species under these conditions.

B. Current Programs

1. Production Program

Continued emphasis was placed on data processing of production and animal issue information in order to achieve greater efficiency in the utilization of limited production facilities. The rate of production of different animals is now being adjusted on the basis of monthly usage, which is expected to reduce the number of nonreimbursable animals produced. The production program was reorganized to include the activities of germfree animal production and a nutrition laboratory.

2. Genetics Program

This program is designed to maintain the genetic integrity and desired features of the foundation inbred strains of mice, rats, and guinea pigs and to support the production effort by providing genetically controlled breeding stock for the production colonies.

C. Program Progress and Accomplishments

During FY 1969, over 1.4 million laboratory rodents and rabbits were produced, with reimbursable issues exceeding one million animals.

Twenty-three inbred strains of mice, 14 of rats, and two of guinea pigs were maintained for NIH research programs. The non-inbred strains included 3 of mice, 8 of rats, 3 of guinea pigs, 4 of hamsters, and one of rabbits. Several miscellaneous species also were maintained.

Four strains of germfree mice and three of rats were available to NIH investigators. Efforts to produce hamsters in germfree state are continuing.

A program was started to cesarean derive breeding stock of five non-inbred rat strains and establish production colonies of these rats within the barrier facilities of Building 14G. The strains are Osborn-Mendel, Holtzmann, NIH Black, Japanese, and Lobund. It is planned also that foundation colonies of all inbred rats will be similarly established behind the barrier. This program gives the best possible assurance that invaluable strains will be protected from disease epizootics and rats free of chronic respiratory disease will be available to the NIH.

Several approved requests for the introduction of new strains of rodents into the colonies are being honored. This practice has been made less dangerous to the colonies by maintaining the animals first in plastic isolators and introducing only cesarean derived offspring that have been examined for pathogenic agents, including the vertically transmitted LCM virus. Plans have been developed to construct a small rodent isolation facility designed specifically for this activity.

A program of serological monitoring of the rodent colonies for viruses was initiated this year. The serum testing is being done commercially under contract.

A nutrition laboratory was established in which food analysis is being performed. NIH feed specifications are being revised in order to make the ingredient quality and quantity consistent with newer knowledge of the nutritional requirements of laboratory animals, and to encourage more open competition, where possible in contract bidding.

Production of fertile hen eggs, free of Resistance Inducing Factor (RIF) is being continued. The flock of chickens was maintained in plastic isolators in two separate rooms, one room at the NIH Animal Center, to protect against loss of the entire colony by contamination.

Production of the much sought after Strain 2 and 13 guinea pigs was increase by enlarging the breeding harems. It is planned that an additional production room of each strain will be set up when rooms are vacated by the movement of conventional rat colonies to barrier environment. The Strain 2 and 13 guinea pigs were issued in FY 1969 according to allotment by Institut as outlined by an ad hoc committee on inbred guinea pig production and usage

Installation of vacuum exhaust systems in the cagewash areas for removal of soiled bedding was completed. This will greatly reduce gross aerosols in the animal rooms.

D. Problems

Shortage of caretaking personnel has resulted in curtailment of production o selected animals. The planned increased production of Strain 2 and 13 guine pigs may not be possible unless more personnel are made available. Further, it will not be possible to increase production to meet demands for NZB and

NZW mice. This problem comes at a time when technical and professional personnel are needed badly to perform environmental and nutritional studies to improve the colonies.

E. Program Plans

It is anticipated that a revised price structure for rodents will be implemented soon, which is based on the animal's weight and age at issue. Also, it is planned that investigators will be charged for animals ordered and then cancelled, when this results in unissuable animals.

It is planned that a rodent isolation facility will be constructed at the NIH Animal Center in FY 1970 to allow complete isolation of new strains prior to introduction into the colonies.

Plans have been made to establish a more elaborate program of genetic monitoring to include skin grafting, electrophoresis and starch-gel analysis of metabolic characteristics, and other physiological measurements. More intensive nutritional studies will include tests of autoclavable diets, determination of the thiamin and niacin requirements of hamsters, and more detailed investigations of the nutrient requirements of germfree and barrier sustained animals.

Production of Laboratory Carnivores and Animal Biologics

A. Objectives

To produce laboratory cats and dogs of defined characteristics to meet intramural research requirements. To provide A-negative blood from donor dogs for experimental surgical use. To maintain herds of ungulate animals, perform immunization procedures for investigators and harvest antisera, blood, and tissue specimens. To maintain a flock of RIF-free chickens in isolators and produce RIF-free eggs for NIH research programs.

B. Current Programs

The dog blood donor colony has been expanded to 180 animals, capable of producing 235 units (500 ml/unit) of blood per month. Expansion involves the addition of new dogs to the colony and replacement of those that have undesirable characteristics. The source of replacements is the breeding colony maintained at Building T-8. Donor dogs are selected for uniformly large size, good temperament, and A-negative blood group. The short term objective is to expand the colony to about 200 dogs.

The dog breeding colony has been expanded to 62 females and seven males, largely of the American foxhound type. All animals which meet the standards as blood donors or replacement breeders have been retained as such rather than issuing them for research use.

English foxhounds continue to be bred on a limited basis. Twenty-five purebred animals are now on hand and are used to produce crosses with NIH white hounds and American foxhounds.

The cat breeding colony now contains 90 breeding females. Intensive culling based on productivity, type, and temperament will continue.

C. Program Progress and Accomplishments

Culling has improved the quality of the blood donor animals appreciably. Blood issues for the year are projected at about 1800 units. Pup issues are projected at about 300 and cat issues at 350.

One hundred sixty-nine American foxhounds, held under contract by a company in New Jersey, have been moved to the NIH Animal Center. Fourteen females and one male will be retained as breeders and 20 as blood donors. The remaining animals will be issued to research investigators.

The flock of RIF-free chickens has done well since it was moved to new facilities at the NIH Animal Center in September. Sixteen pullets are producing about eight dozen eggs weekly. Another 33 birds should be in production during FY 1969.

D. Problems

Attempts to locate harrier hounds to incorporate into the breeding colony have been unsuccessful. This breed would bridge the weight gap between beagles and foxhounds.

Inadequate space will soon curtail further expansion of both the breeding and blood donor colonies. Complete conversion from random source dogs to laboratory reared dogs and blood donor dogs is not possible with available space.

E. Program Plans

Within the currently available space, the blood donor colony will be expanded to 200 animals, brood bitches to about 100, and the cat colony will remain stable.

Studies to provide for further characterization of animals and blood are planned.

Quarantine and Conditioned Animals

A. Objectives

To provide intramural research programs, insofar as possible, healthy random source dogs, cats, primates, and feral animals.

B. Current Programs

The program consists of controlled quarantine and conditioning procedures. Preventive medicine programs and application of sound husbandry practices constitute the core of the program.

Procurement, processing, and issue of animals proceeded as anticipated without major changes from preceding years. Dog issues were lower, reflecting the increased production of canine blood by the donor colony. Minor shortages of dogs and cats occurred twice during the year, resulting from short supplies from vendors occurring simultaneously with increased use by investigators. However, at no time were investigators totally denied research subjects. Population of all animals was maintained at the highest levels consistent with available supplies and space.

C. Program Progress and Accomplishments

The 45-day conditioning period for dogs and cats was continued, maintaining the high quality of issued animals. Increased use of primates, accompanied by a trend toward use of chimpanzees and other large primate species, continues to stress the available facilities. Issues of primates increased from 2,576 in FY 1968 to about 3,500 this year. Dog issues for the year are projected at about 1,980; about 1,600 fewer than in FY 1968. This reduction reflects the increasing acceptance of dog blood in place of dogs by many investigators. Cat issues are projected at about 2,800; about the same as last year.

D. Problems

Delays in construction of the primate facility at the NIH Animal Center continue to restrict the expansion of primate conditioning and breeding required to meet NIH investigator demands.

E. Program Plans

Conditioning of random source dogs is expected to gradually decline as the blood donor colony and breeding colony are expanded and their products are issued. It is planned that, at some point, the conditioning of the small number of random source dogs will be done by contract. However, this will not be possible until additional space for the blood donor and breeding colonies is available.

Conditioning of random source cats will continue at its current rate until expansion of the breeding colony in barrier isolation is possible. Future expansion of Building 102 at the Animal Center includes space for this.

The proposed new primate building at the Animal Center should permit expansion of primate conditioning. Space at Bethesda then should be available for long-term holding and the establishment of a breeding colony.

Animal Health

A. Objectives

To characterize and improve the health status and to study the naturally occurring diseases of laboratory animals produced, quarantined, or utilized in biomedical research at the National Institutes of Health.

B. Current Programs

Disease control in closed colonies of rodents and rabbits is met through a multi-disciplined approach to monitoring. Comparative Pathology Section pathologists and microbiologists work closely with the Rodent and Rabbit Production Section to control and eliminate infectious disease.

The Section also provides laboratory diagnostic service in conjunction with the disease control programs of the Dog, Cat, and Primate Quarantine Units, the Carnivore and Ungulate Units and provides bacteriologic monitoring service for the barrier sustained animals.

Routine control of infectious diseases of primates is approached through a program of tuberculin testing, bacteriologic monitoring, and treatment of clinically affected animals with drugs and antibiotics. Control of infectiou diseases of dogs and cats is carried out through a program of routine immunization and by treatment of clinically affected animals with drugs and antibiotics. Health of farm animals is maintained through a program of preventive medicine and routine testing.

A nutrition laboratory has been established as a part of the rodent and rabbi production facilities for the purpose of defining nutritional diseases and increasing the knowledge of nutritional requirements of laboratory animals.

C. Program Progress and Accomplishments

For the second successive year, the rodent and rabbit production colonies suffered no major disease outbreaks.

Salmonellosis has not recurred in the guinea pig colonies since the feeding of kale was discontinued in late 1966. The data at that time indicated that kale contaminated by poultry manure had been the source of previous infection Cabbage washed in chlorine solution with the outer leaves discarded was substituted for kale.

Monitoring personnel for salmonellosis has been programmed on an annual basis by the Employee Health Service. Five people report for testing weekly. No positive cases were reported this year.

A program of serological monitoring of the rodent colonies for 13 viruses was initiated. Sera diluted one to five and heat inactivated are being sent to Microbiological Associates, Inc., for testing under contract.

Studies continue to support the hypothesis that bacteria play a fundamental role in the pathogenesis of chronic respiratory disease of rats. A detailed survey analysis designed to show the degree of correlation between bacterial isolation and the lesions in rats of varying age is in progress.

It was found that the production of hamsters increased considerably when the fat content of the food pellets fed to preweanling animals increased from 4 percent to 6 percent.

When the level of protein fed Strain 13 guinea pigs was reduced from 24 percent to 17 percent, the rate of stillbirths was decreased by over 100 percent.

The room of RIF-free chickens in open cages was found to be contaminated with lice. Dusting the chickens four successive times with rotenone powder and treating the room with malathion was effective in eradicating the parasites. All RIF-free chickens are now in plastic isolators.

The program to stock a barrier room with gnotobiotic guinea pigs was unsuccessful. A colony of some 100 pigs was reached and a number of females were bred and raised their litters before the entire colony was lost due to bacterial contamination. Another attempt will be made using plastic isolators on a smaller scale.

In the carnivore breeding colonies, respiratory diseases of undetermined origin have reached epizootic proportions in both pups and kittens when large populations were on hand. Therapy has been effective and the mortality low.

Fight wounds continue to be a problem in dogs. No practical solution has been found to avoid them.

The stillborn rate has been four percent in dogs and five percent in cats. The cause is unknown.

Contagious ecthyma, which is endemic in Maryland, was diagnosed clinically in quarantined goats. With isolation of the animals, the disease remained benign and eventually disappeared.

Keratoconjunctivitis has occurred sporadically in goats. The disease responds to wide spectrum antibiotics but recurs often when therapy is discontinued. Attempts are underway to determine the etiology.

Respiratory diseases have been a continuous problem in ungulates. Deaths are rare since most of the animals respond to therapy.

In random source dogs, the major problem during quarantine has been respiratory disease which failed to respond to antibiotic and supportive therapy. The death rate in these dogs has been approximately 18 percent. Of these deaths, 33 percent were attributable, on gross observation, to fulminant hemorrhagic pneumonia, which was found to be caused by Streptococcus zooepidemicus. Last year only four percent of the deaths were believed due to this agent. Although the agent is known to be sensitive to high concentration of furacin in vitro, the duration of the disease is generally too short for effective therapy to be instituted.

Screening of all dogs for microfilaria at the time they are offered by vendors for sale resulted in the rejection of 220 dogs.

The incidence of tuberculosis in primates increased sharply for a short time during the winter. Issue of monkeys was prohibited for a two week period.

Special and Consultative Services

A. Objectives

Special services pertaining to programs requiring the use of animals and animal facilities are provided to Institutes and Divisions on a continuing basis. These include consulting on animal problems, issuing health certificates, furnishing surgical and X-ray services, and producing and issuing blood and blood products.

B. Current Programs

Veterinarians and other professional personnel furnish NIH investigators with information and advice concerning animal anatomy, physiology, genetics, husbandry practices, and disease problems. They also give advice regarding appropriate selection of animals for experimental procedures.

Outside inquiries on animal programs and facilities are also answered. Extensive time is devoted to visitors from all parts of the United States and abroad who have specific problems and questions regarding animal facilities and care. Staff members participate in the review of plans for construction and renovation of animal facilities for our own programs and provide similar consultative services to the Institutes and Divisions.

Surgical and radiological services are provided the Institutes and Divisions, including postoperative and long-term care for animals. Limited space and service are also available for radioisotopic procedures. Assistance and facilities are provided for acute experimentation and for the collection of metabolic by-products and body fluids from animals.

C. Program Progress and Accomplishments

The Building 28 Experimental Surgery and X-ray facilities are operating at about the same level as last year. Requests for surgery on primates and primate post-operative care have increased considerably. Updating and sophistication of equipment and techniques in the surgery and postoperative areas continue.

Requests for large animals (ungulates) have increased.

Installation of an X-ray unit in Building 100 at the Animal Center was completed during FY 1969. This has made facilities available to NIH investigators for radiography of large (farm-type) animals for the first time. Increased numbers of experimental surgery procedures were performed in the ungulate facility at the Animal Center.

D. Problems

Facilities are inadequate or lacking for radioisotope and infectious disease work, housing of primates postoperatively and on a long-term basis, and housing of exotic species. Additional space for ungulates is needed and funds for making additions to Building 100 have been requested.

E. Program Plans

The Branch is continuing a comprehensive consultation program to assist the Institutes and Divisions in all areas of animal care and disease control. Existing activities in these areas will be further consolidated, and the program more adequately staffed to give NIH an organized and uniform program of animal care. An expanded training program for animal caretaker personnel was initiated in September 1968.

Media Production

A. Objectives

To produce and issue high quality bacteriological and tissue culture media and tissue culture cells under controlled conditions. To furnish consultative services to the Institutes on related matters.

B. Current Programs

Media production is programmed to meet Institute and Division requirements for standard and special media that cannot be economically or satisfactorily obtained from commercial sources. Tissue culture cell production is aimed at supplementing Institute requirements not met by commercial contracting or individual laboratory preparation. Automated equipment is utilized wherever possible.

The quality control program for media and cell production, including the sterility testing of each order of cell culture media, has been well received by NIH investigators. This program was further expanded this year to include a seven-day holding period for each lot of media before delivery.

The tissue culture cell bank program also has been expanded this year to take full advantage of the automatic liquid nitrogen freezing equipment. The freezing operations are now being done under controlled conditions, thus relieving the investigators of having to freeze cells by a variety of methods in their own laboratories.

C. Program Progress and Accomplishments

The number of requisitions processed has continued to increase gradually. Despite this, the volume of bacteriological and tissue culture media issued has leveled off, apparently because the requisitioners no longer order more than needed to offset contamination losses. The new quality control methods have reduced the contamination rate from over 8.5 percent to 2.4 percent in one year. This figure is well below the commonly accepted rate of 5 percent which most suppliers of media consider standard.

A new Tissue Culture Media Formulary is scheduled for printing before the end of FY 1969. Its preparation has been a major undertaking and when completed will provide the Institutes with a ready reference to types of tissue culture media available. Supplements are planned in the future on a more regular basis to keep the Formulary up to date.

During FY 1969 the media program was converted to an IBM system of recording and reporting workload. After some initial problems, the system has resulte in a smoother operation with much useful data available for present and futu use.

An automatic test tube capping machine was purchased commercially and modifi to permit automatic feeding of tubes to the machine and dispensing of media or cells on a production scale. The system has resulted in a significant increase in speed of production in screw cap tubes of all types of media and tissue culture cells. The machine is the first of its kind in this country and has generated widespread interest in both commercial and government laboratories.

D. Problems

The Media Unit continues to suffer from the inadequacies and limitations of its existing production space. The present area has been modified to the limits possible and automation substituted wherever feasible. Lack of suitable space to efficiently use newer automated equipment has become an increasing problem. In view of the fact that the Unit is producing at near maximum levels, it cannot be expected that requirements imposed by the occupancy of laboratories presently under construction can be met by the existing production capacity.

E. Program Plans

Emphasis will continue on increased automation of all feasible aspects of media and cell production. An automatic plate pouring machine has been designed and is under construction as well as a machine for capping bottled media in three volumes.

Minimal expansion of tissue culture cell production is expected by taking advantage of the increased tubing capability.

Glassware Preparation

A. Objectives

To furnish NIH investigators laboratory glassware of the highest quality by processing through the steps of decontamination, sorting, cleaning, inspecting, plugging, wrapping, sterilizing and issuing. This overall operation includes processing of used glassware from the investigators and the introduction of new glassware from replacement stock.

To furnish consultative services on problems associated with laboratory glassware.

To furnish cagewashing services to the Clinical Center, Auburn Building, and Patuxent River Laboratory. To furnish ethylene oxide gas sterilization for heat labile patient and laboratory equipment from the Clinical Center and other Institutes and Divisions, upon request.

B. Current Programs

In addition to filling Institutes' demands for the volume and types of glassware, the Unit evaluates management and technical methods and equipment for improving the quality and maintaining the volume of issued glassware.

The cagewashing unit furnishes the services cited under A and studies problems associated with corrosion, scaling, etc. Washing the rubber-backed carpets for the Clinical Center is still continued, and from reports received, this is the best way to clean them.

C. Program Progress and Accomplishments

Glassware issues to the contributing Institutes and Divisions in FY 1969 increased by 1,300,000 pieces over FY 1968.

In January, for the first time since the Glassware program was started, the number of pieces of glassware issued exceeded one million pieces for a single month.

The newly designed automatic pipette packaging machine has eliminated the usual shortages of individually wrapped pipettes and allowed all demands for this item to be met.

The entire glassware operation was converted to the revolving fund this year. No real problems have been encountered as yet, and the Institutes appear to be satisfied with present fees for service.

D. Problems

As in previous years the Unit has continued to have a problem in supplying the daily demands for glassware trays for return of dirty glassware. Periodic orders for new trays at 300 trays per order seem to relieve the situation for short periods of time but demand still exceeds the supply.

Responsibility for regeneration of three large deionizers still rests with Glassware Unit, and should be transferred to PEB so that the operation can be properly maintained for all users of distilled water in the Clinical Center.

E. Program Plans

Renovation of the glassware sorting area is planned for this year.

The trend to automation is expected to continue with plans for two pipette plugging machines under consideration. These machines will allow for more efficient utilization of the pipette packaging machine by providing enough

pipettes to keep the machine busy. It is planned to locate the machines near the wrapper, so that one person can operate the entire system.

PUBLICATIONS

Palmer, A.E., Allen, A.M., Tauraso, N.M. and Shelokov, A.: Simian hemorrhagic fever. Part I. Clinical and epizootiologic aspects of an outbreak among quarantined monkeys. Amer. J. Trop. Med. 17: 404-412, 1968

Allen, A.M., Palmer, A.E., Tauraso, N.M. and Shelokov, A.: Simian hemorrhagic fever. Part II. Studies in pathology. Amer. J. Trop. Med. 17: 413-421, 1968

Tauraso, N.M., Shelokov, A., Palmer, A.E. and Allen, A.M.: Simian hemorrhagic fever. Part III. Isolation and characterization of a viral agent. Amer. J. Trop. Med. 17: 422-531, 1968

Tauraso, N.M., Shelokov, A., Allen, A.M., Palmer, A.E. and Aulisio, C.G.: Epizootic of simian haemorrhagic fever. Nature 218: 876-877, 1968

Ganaway, J.R., and Allen, A.M.: Chronic murine pneumonia of laboratory rats. Production and description of pulmonary-disease-free rats. Lab. Anim. Care 19: 71-79, 1969

Zinn, R.D.: The research dog. J. Amer. Vet. Med. Ass. 153: 1883-1886, 1968

Potkay, S., and Zinn, R.D.: Effects of collection interval, body weight, and season on the hemograms of canine blood donors. Lab. Anim. Care 19: 192-198 1969

PRESENTATIONS

Allen, A.M.: Simian hemorrhagic fever. Paper presented at workshop on Virus Diseases Which Impede Colonization of Nonhuman Primates. National Center for Primate Biology, University of California, Davis, Calif., May 23, 1968

Allen, A.M.: Simian hemorrhagic fever. Paper presented as faculty participant in course entitled "Pathology of Laboratory Animals," Armed Forces Institute of Pathology, Wash., D.C., September 13, 1968

Zinn, R.D.: The research dog. Paper presented at the 105th Annual Meeting of the American Veterinary Medical Association, Boston, Mass., July 25, 1968

Zinn, R.D.: The research dog. Presented informally to the annual meeting of the Professional Dog Handlers Association, Washingtonian Motel, Gaithersbu Maryland, on August 7, 1968

Serial No. DRS-LAB-1

1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: CHRONIC MURINE PNEUMONIA OF THE ALBINO RAT

Previous Serial Number: DRS-LAB-1

Principal Investigator: James R. Ganaway

Other Investigators: Anton M. Allen
Thomas D. Moore

Cooperating Units: Rodent and Rabbit Production Section

Man Years

Total:	3.0
Professional:	.5
Other:	2.5

Project Description:

Objective: To elucidate the cause of Chronic Murine Pneumonia. To characterize this disease complex as it occurs in the NIH colonies. To establish means of early detection and prevention under colony conditions.

Methods Employed: Microbiology, immunology, and pathology.

Major Findings: Experimental results continue to support our hypothesis that bacteria play a fundamental role in the pathogenesis of this disease complex. Improved isolation technique has been developed for the detection of mycoplasma infections. A detailed survey analysis designed to show the degree of correlation between bacterial isolation and the lesions found in rats of varying age is in progress.

Significance: Aside from this disease complex being the greatest cause of morbidity and eventual mortality in rat colonies raised under conventional conditions, increased attention is being focused today on the human diseases of aging. Notable examples are chronic respiratory disease and emphysema. Study of the CMP syndrome in the rat may prove beneficial to a better understanding of this human disease syndrome of aging.

Proposed Course: Continuation

Honors and Awards: None

Publications: "Chronic Murine Pneumonia of laboratory rats. Production and description of pulmonary-disease-free rats." by James R. Ganaway and Anton M. Allen, Laboratory Animal Care, 19:71-79, 1969.

Serial No. DRS-LAB-2

1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: FOCAL NECROSIS OF THE LIVER OF RABBITS

Previous Serial Number: DRS-LAB-2

Principal Investigator: James R. Ganaway

Other Investigators: Thomas D. Moore
Anton M. Allen

Cooperating Units: Rodent and Rabbit Production Section

Man Years

Total:	2.5
Professional:	.5
Others:	2.0

Project Description:

Objective: To characterize and identify the etiologic agent. To study the pathogenesis of the disease through experimental transmission studies. To recommend measures for control or prevention in the rabbit colonies.

Major Findings: Though this disease has continued to smolder in the rabbit production colony at the NIH, another year has passed without epizootic. This is due in part to the early detection of the disease (through diagnosis at necropsy) in any rabbit which dies in the production colony, followed by the recommendation to immediately destroy all cagemates and to disinfect the cage, feeders, waterers and environs. The causative agent has been isolated in our laboratory. Transmission experiments using washed spore suspension of known strength (titration results in embryonated chicken eggs) have been successfully completed in rabbits. A manuscript intended for publication is in preparation.

Proposed Course: Continuation

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-3
1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: FEBRILE HEMORRHAGIC DISEASE OF MONKEYS

Previous Serial Number: DRS-LAB-3

Principal Investigator: Anton M. Allen

Other Investigators: Amos E. Palmer
Nicola M. Tauraso
Alexis Shelokov

Cooperating Units: Laboratory of Virology and Rickettsiology, DBS

Man Years

Total:
Professional: None
Other:

Project Description: See Individual Project Report July 1, 1967 through June 30, 1968

Proposed Course: Completed

Honors and Awards: None

Publications: "Simian Hemorrhagic Fever. Part I. Clinical and epizootiologi aspects of an outbreak among quarantined monkeys." by Amos E. Palmer, Anton M. Allen, Nicola M. Tauraso and Alexis Shelokov, Amer. Jour. Trop. Med. and Hyg., 17: 404-412, 1968.

"Simian Hemorrhagic Fever. Part II. Studies in pathology." by Anton M. Allen Amos E. Palmer, Nicola M. Tauraso and Alexis Shelokov, Amer. Jour. Trop. Med. and Hyg., 17: 413-421, 1968.

"Simian Hemorrhagic Fever. Part III. Isolation and characterization of a vir agent." by Nicola M. Tauraso, Alexis Shelokov, Amos E. Palmer and Anton M. All Amer. Jour. Trop. Med. and Hyg., 17: 422-431, 1968.

"Epizootic of Simian Haemorrhagic Fever." by Nicola M. Tauraso, Alexis Shelokov, Anton M. Allen, Amos E. Palmer and Calvin G. Aulisio, Nature, 218: 876-877, 1968.

Serial No. DRS-LAB-4
1. Laboratory Aids Branch
2. Animal Biologics Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: THE EFFECTS OF A HEMATINIC ON THE BLOOD PICTURE OF DONOR DOGS

Previous Serial Number: DRS-LAB-5

Principal Investigator: Chester W. Anderson

Other Investigators: None

Cooperating Units: None

Man Years

Total:	.40
Professional:	.20
Others:	.20

Project Description:

Objective: To determine the effects of an iron-rich hematinic on the erythroid cell series of canine blood donors, with a view toward increasing the blood production from the donor colony.

Methods Employed: Canine blood donors are bled at 2, 3, and 4 week intervals. They receive injections of iron-dextran which are designed to replace the iron loss accompanying volume blood donation. Injections are administered two days following the donation. Hematocrit, hemoglobin, red and white cell counts, and plasma protein determinations are made each week. The results are charted and compared to those obtained from control dogs which are bled on an identical schedule but do not receive iron injections.

Major Findings: Preliminary evaluation of the data indicates that parenteral supplementation with iron enhances red blood cell production in donor dogs and decreases the time required for cellular elements to return to normal.

Significance: The current bleeding schedule for donor dogs is once every three weeks. Parenteral administration of iron to donor dogs may permit more frequent bleeding and result in better utilization of the donor colony.

Proposed Course: Completed. Data to be evaluated.

Honors and Award: None

Publications: Manuscript is being prepared.

Serial No. DRS-LAB-5

1. Laboratory Aids Branch
2. Animal Biologics Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: CANINE HEMOLYTIC ANEMIA

Previous Serial Number: DRS-LAB-6

Principal Investigator: Chester W. Anderson

Other Investigators: Mary C. Strott
Stephen Potkay

Cooperating Units: Laboratory of Blood and Blood Products, Division of Biologics Standards

Man Years:

Total:	.5
Professional:	.3
Others:	.2

Project Description:

Objectives: To add further to the knowledge of the following: 1) hemolytic anemia in the puppy caused by mating dogs and bitches with incompatible blood groups; 2) the mechanism of antibody transfer from the bitch to the pup; 3) the genetics involved in the transfer of the A factor in the canine.

Methods Employed: Matings between dogs of similar and incompatible blood groups are made. Bitches are titered throughout gestation to note any rise in titer of the anti-A factor. Puppies are blood grouped and titered for the anti-A factor before and after nursing for the first time, and daily for the first several days of life. Milk samples are titered for the anti-A antibody. Several matings of both a compatible and incompatible nature will be made with each bitch.

Major Findings: No results have been obtained yet.

Significance: This project will contribute to understanding mechanisms of disease which produce hemolytic anemia in puppies. This disease has not been clearly characterized in the literature but is generally included with other neonatal diseases under the heading of the fading puppy syndrome.

Proposed Course: Continuation

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-6

1. Laboratory Aids Branch
2. Animal Biologics Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: FEED CONSUMPTION STUDIES IN THE CANINE

Previous Serial Number: DRS-LAB-8

Principal Investigator: Chester W. Anderson

Other Investigators: None

Cooperating Units: None

Man Years

Total:	.8
Professional:	.2
Others:	.6

Project Description:

Objectives: 1) To determine the feed consumption per kilogram body weight in puppies from bith to one year of age. 2) To determine the feed consumption per kilogram body weight in bitches from breeding through parturition and lactation to weaning. 3) To determine the feed consumption per kilogram body weight in donor dogs on active donation schedule. 4) To determine the feed consumption per kilogram body weight in "resting" dogs, such as open bitches, males, and cell donors.

Methods Employed: Dogs are weighed at weekly intervals and a record kept on the amount of feed consumed. The results are graphed, and values are determined.

Major Findings: Data have not been tabulated.

Significance: Standard growth curves will be obtained for American and English foxhounds where none presently exist. The data will also contribute to the determination of costs for housing and rearing dogs in the colony.

Proposed Course: Continuation

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-7

1. Laboratory Aids Branch
2. Comparative Pathology Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: MYCOBACTERIOSIS IN THE OPOSSUM

Previous Serial Number: None

Principal Investigator: Thomas D. Moore

Other Investigators: Anton M. Allen

Cooperating Units: National Institutes of Health Animal Center

Man Years

Total:	1.0
Professional:	.3
Others:	.7

Project Description:

Objective: The identification and delineation of an atypical Mycobacterium species isolated from an apparent natural infection.

Methods Employed: Histopathological and bacteriological studies employed with transmission studies on the suspected causative agent.

Major Findings: The identification of the organism as a member of the Battey-avium-swine complex of Runyon Group III has been confirmed. The serological heterogeneity of this group has been demonstrated although many strains in this group do react significantly with avian bacillus antiserum. Skin sensitivities were determined in experimentally infected rabbits and guinea pigs with commercial avian and mammalian old tuberculins, commercial Battey and avian purified protein derivatives (PPD) and an antigen prepared from the organism in a manner similar to the old tuberculin method. The rabbits showed slight reactivity to concentrated mammalian tuberculin and to the homologous antigen but failed to react to the former in a more dilute inoculum. The guinea pigs reacted to mammalian tuberculin at both concentrations, to Battey PPD and to the homologous sensitin. A manuscript entitled "A Fatal Infection in the Opposum due to a Mycobacterium of Runyon Group III" has been accepted for Publication subject to some revisions which are being made.

Significance: The documentation of mycobacterial infection in the opossum in his natural habitat is apparently nonexistent. The ever-increasing reports of the isolation of these atypical mycobacteria from diverse sources in nature emphasizes the need to restate the potential public health hazard they represent.

Proposed Course: A manuscript is being completed for journal submission.

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-8
1. Laboratory Aids Branch
2. Rodent and Rabbit Production Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: STRAIN AND SEASON DIFFERENCES IN THE REPRODUCTIVE PERFORMANCE OF INBRED STRAINS OF MICE, RATS AND GUINEA PIGS

Previous Serial Number: None

Principal Investigator: Carl T. Hansen

Other Investigators: W. J. McEleney and W. J. Hinkle

Cooperating Units: None

Man Years

Total:	.5
Professional:	.5
Others:	.0

Project Description:

Objectives: 1) To compare the reproductive performance between the inbred strains maintained in the Genetics Unit in each of the three species. 2) To compare season effects on reproductive performance. 3) To obtain a measure of the factors which affect overall reproductive performance within each of the strains.

Methods Employed: Data for analysis are based on weekly records which include female breeder count, number of pregnancies, number litters born, number of litters weaned, number of pregnancy losses, and total number of offspring weaned. These data are then analyzed by the appropriate statistical methods.

Major Findings: Analysis thus far indicates that with respect to strain differences, the frequency of pregnancies and frequencies of pregnancy loss are the two most important factors which differentiate the level of reproductive performance between strains within species. Also, there are significant season effects.

Significance: These data will serve as a basis for future plans with respect to space allocations for each strain and to plan further detailed studies on the reproductive patterns of the inbred strains.

Proposed Course: Continuation. Manuscript has been accepted for publication in the Proceedings of the International Committee on Laboratory Animals' Symposium on "Defining the Laboratory Animal in the Search for Health."

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-9
1. Laboratory Aids Branch
2. Rodent and Rabbit Production Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: A COMPARISON OF LIFETIME REPRODUCTIVE PERFORMANCE OF INBRED AND NON-INBRED MICE ON TWO FEEDING REGIMES

Previous Serial No.: None

Principal Investigator: W. J. Hinkle

Other Investigators: Carl T. Hansen and W. J. McEleney

Cooperating Units: None

Man Years

Total:	.2
Professional:	.1
Others:	.1

Project Description:

Objectives: 1) To calculate lifetime reproductive curves for eight inbred strains and one non-inbred stock of mice. 2) To assess the importance of adding a dietary supplement to the prepared diets. 3) To estimate the genetic components of lifetime reproductive performance.

Methods Employed: In each of nine groups of mice, 70 breeding pairs were fed a commercial diet only and 70 pairs were fed the commercial diet plus a twice-weekly supplement of kale, bread, and milk. The total number of pregnancies, pregnancy losses, and offspring weaned were recorded. In addition, litter weights were obtained for the offspring at two weeks of age and individual weights at three weeks of age.

Major Findings: Analyses are not complete, however, preliminary analysis shows that strain differences are present for lifetime reproductive performance and that the supplement does improve the level of reproductive performance.

Significance: The results will be used to plan breeder rotation systems in each strain/stock and to assess the value of providing a dietary supplement with the commercially prepared diets.

Proposed Course: The project will be concluded when the analysis is complete.

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-10
1. Laboratory Aids Branch
2. Rodent and Rabbit Production Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: THE EFFECT OF VEGETABLE SUPPLEMENTATION ON GOLDEN HAMSTER REPRODUCTION AND GROWTH

Previous Serial Number: None

Principal Investigator: Joseph J. Knapka

Other Investigators: F. J. Judge

Cooperating Units: None

Man Years

Total:	.1
Professional:	.1
Others:	.0

Project Description:

Objective: To test the effect of apple and carrot supplements on growth and reproduction of the Golden Hamster.

Methods Employed: A commercial laboratory animal ration was supplemented with (a) apple, carrot, and a rabbit ration; (b) apple and carrot; (c) apple; and (d) carrot. Group (e) served as a control receiving no supplement. Water was available to all groups ad libitum.

Major Findings: Data from a study involving 24 matings on each treatment showed that conception rate ranged from 95.6 percent for group (e) to 73.9 percent for group (a). In general, supplementation had little effect on litter size at birth, preweaning mortality, or percent of pups weaned. Mean weights of pups weaned were 44.6, 41.7, 42.0, and 40.7 grams for groups (a) through (d) respectively, and 40.4 grams for the control group. Mean weaning weights of hamsters fed supplements, including apples, were significantly ($P<.01$) higher than the weights of those fed either carrots or no supplement; but they were significantly ($P<.01$) lower than weights of hamsters supplemented with the apple, carrot, and rabbit ration. Results of a 28-day growth study indicate that hamsters in group (a) gained significantly ($P<.01$) more weight, 68.2, than those in groups (b) 60.4g, (c) 60.8g, or (d) 59.6g. These values (b, c, and d) however, were significantly ($P<.01$) higher than the weight gain of hamsters on the control diet (52.4g).

Significance: This data was the basis for discontinuing the practice of feeding supplemental carrots to hamsters.

Proposed Course: Completed. This data is included in an invited paper to be presented at an American Association of Laboratory Animal Science Symposium on Laboratory Animal Nutrition.

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-11
1. Laboratory Aids Branch
2. Rodent and Rabbit Production Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: THE EFFECT OF PHYSICAL CHARACTERISTICS OF RATIONS ON GOLDEN HAMSTER REPRODUCTION

Previous Serial Number: None

Principal Investigator: Joseph J. Knapka

Other Investigators: F. J. Judge

Cooperating Units: None

Man Years

Total:	.1
Professional:	.1
Others:	.0

Project Description:

Objective: To test the effects of rations that are similar in nutrient content but differing in physical hardness of pellets on the reproductive performance of hamsters.

Methods Employed: Three experimental rations, similar in nutrient content but varying in pellet hardness were fed ad libitum to three groups of 72 female hamsters beginning approximately four days prior to littering with their first litter and continuing until the birth of their second litter. The rations (1 soft, 2 intermediate, and 3 hard) were supplemented with both apple and carrot while water was available ad libitum.

Major Findings: Pellet hardness had no consistent effect on conception rate, size of litter at birth, or on number of dead pre-weanlings removed from the cages. Cannibalism rate of pups between birth and weaning was 9.8, 20.3, and 32.8 percent for rations 1, 2, and 3, respectively. Percentages of pups weaned were 73.5, 66.7, and 50.7 for rations 1, 2, and 3, respectively; with mean weaning weight of 42.5, 35.5, and 33.9 grams. Differences between these means were statistically significant ($P < .005$)

Significance: These data are the bases for feeding a ration that is formulated with ingredients that result in a softer pellet. The addition of fat to the formulation of a ration is one way to produce a softer pellet.

Proposed Course: Completed. These date are included in an invited paper to be presented at an American Association of Laboratory Animal Science Symposium on Laboratory Animal Nutrition.

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-12
1. Laboratory Aids Branch
2. Rodent and Rabbit Production Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: THE EFFECT OF APPLE SUPPLEMENTATION AND VARIOUS LEVELS OF DIETARY FAT ON GROWTH OF GOLDEN HAMSTERS (Mesocricetus auratus)

Previous Serial Number: None

Principal Investigator: Joseph J. Knapka

Other Investigators: F. J. Judge

Cooperating Units: None

Man Years

Total:	.15
Professional:	.10
Others:	.05

Project Description:

Objectives: To test various levels of dietary fat on the growth rate of Golden Hamsters.

Methods Employed: Four groups of 48 weanling hamsters each were assigned to be fed (ad libitum) iso-nitrogenous rations containing 3, 5, 7 and 9 percent fat. During a 35-day growth trial, the diet of one-half the hamsters fed each experimental ration was supplemented with 5g of apple per animal per day. Water was offered ad libitum to all hamsters.

Major Findings: Criteria of evaluation were gain in body weight, dry matter consumption, and feed efficiency. Supplemental apple significantly ($P<.01$) increased gain in body weight, had no effect on dry matter consumption, and only slightly improved feed efficiency ($P<.05$). Hamsters fed the 7 percent level of fat gained the most weight; however, not significantly ($P>.10$) when compared to the gain in body weight by those fed the 5 and 9 percent levels of fat. The difference in gain of body weight between hamsters fed the 3 and 5 percent levels of fat was significant ($P<.05$). Dry matter consumption increased as fat level of ration increased, however, this relationship was inverse for feed efficiency.

Significance: These data suggest that supplemental apples provide the hamster with some compound that will enhance growth but it is not an absolute requirement for growth. A level of dietary fat between 5 and 6 percent is optimal for hamsters.

Proposed Course: Continuation to test rations containing 6 percent fat from both animal and vegetable sources. To attempt to define the chemical characteristics of the factor in apple supplement that will enhance the growth of hamsters.

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-13
1. Laboratory Aids Branch
2. Experimental Surgery Section
3. Bethesda

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: THE STUDY OF SPONTANEOUS LYMPHOMA IN DOGS

Previous Serial Number: None

Principal Investigator: Ralph E. Johnson

Other Investigators: Gregory T. O'Conor
William K. Titus
John B. Maloney

Cooperating Units: Radiation Safety Branch, NCI (NCI-60-53)
Pathologic Anatomy Branch, NCI
Viral Biology Branch, NCI

Man Years

Total:	.2
Professional:	.2
Others:	.0

Project Description:

Objectives: It is the purpose of this study to 1) define the essential clinical features of lymphoma in dogs, 2) develop a histopathologic classification, 3) investigate the possible virus etiology, 4) screen a representative number of tumors for cytogenetic abnormalities, 5) evaluate various immunologic parameters in diseased versus normal animals and, finally 6) undertake comparative response studies with representative chemotherapeutic agents and irradiation.

Methods Employed: Clinical evaluation, histopathology and cytogenetics, immunologic studies, and comparative chemotherapeutic trials.

Major Findings: Data are being compiled.

Significance: There have been a number of epizootologic, clinical and cytologic studies on spontaneous lymphoma in dogs, but these have been relatively incomplete in terms of using this canine disease as a potential model system for experimental therapeutics in cancer research. Preliminary studies in the Radiation Branch, NCI, have suggested gross similarities between canine and human lymphosarcoma in terms of response to irradiation.

However, insufficient information is available about the biology of the disease at present to provide a sound basis for undertaking comparative therapeutic trials.

Proposed Course: Continuation

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-14
1. Laboratory Aids Branch
2. Animal Biologics Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: HEMATOLOGY OF NORMAL SHEEP AS AFFECTED BY FREQUENCY OF DONATION

Previous Serial Number: None

Principal Investigator: Stephen R. Cobb

Other Investigators: None

Cooperating Units: None

Man Years:

Total:	.52
Professional:	.10
Others:	.42

Projection Description:

Objectives: To analyze data of three different donation frequencies over a one-year period and determine the most desirable long-term volume collection schedule for this species.

Methods Employed: Blood is being collected at the rate of 15 ml/Kg from three groups of sheep--Group A, once every second week; Group B, once every third week; and Group C, once every fourth week. Group D serves as controls (no collection). Body weight, temperature, physiological status, packed cell volume, hemoglobin, erythrocytes leukocytes, reticulocytes, serum protein and cell diameter are recorded before each collection. Hematological values are recorded on the donated blood following collection.

Major Findings: It appears that all groups are tolerating the prescribed donation schedules at the thirty-week point.

Significance: Blood collection schedules should be determined for each species in order to avoid "over bleeding" of the animals and production of variable or inferior blood.

Proposed Course: Continuation

Honors and Awards: None

Publications: None

Serial No. DRS-LAB-15
1. Laboratory Aids Branch
2. Animal Conditioning Section
3. Poolesville

PHS-NIH
Individual Project Report
July 1, 1968 through June 30, 1969

Project Title: STUDIES OF THE MICROBIAL FLORA OF TISSUES FROM RANDOM SOURCE DOGS

Previous Serial Number: None

Principal Investigator: Amos Palmer

Other Investigators: Kendall Smith
Gerald Carey
James Rich
Flora Cohen

Cooperating Units: Laboratory of Biophysics and Biochemistry, DBS
Comparative Pathology Section, LAB, DRS

Man Years

Total:	2.5
Professional:	0.3
Others:	2.2

Project Description:

Objectives: To attempt to isolate and identify viral and bacterial agents from certain tissues of sick random source dogs to determine the spectrum of agents and frequency of occurrence of these agents. Virologic studies performed by DBS fit into their Biologics Control program, thus the work serves two purposes.

Methods Employed: The animals were anesthetized and exsanguinated, saving all blood for serum harvest. Selected tissues were removed aseptically and cultured for bacterial and in tissue cultures. Tissue cultures were examined for CPE and by indirect fluorescent antibody reagents for viral replication. Virus isolates were characterized by CPE, serum neutralization studies, and biochemical and biophysical means. Isolates were stored in low passage levels for possible pathogen studies. Bacteria were subjected to routine bacteriologic techniques for identification.

Major Findings: Bacteriologic cultures have yielded some strains of bacteria with unexpected frequency. Virologic studies have not yet proceeded adequately to determine results.

Significance: It is hoped that better understanding of microbial agents harbored by random source dogs will permit a more rational approach toward dealing with infectious disease problems.

Proposed Course: Continuation to complete the study of 30 animals.

Honors and Awards: None

Publications: None

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1968, through June 30, 1969

LIBRARY BRANCH Seymour I. Taine, Chief

I. SUMMARY

A review of the personnel and services in all areas of the Library was made by the new Chief, LB, after his entry on duty in August. An early acquaintance with the entire library operation was necessary to determine priorities in view of the critical personnel ceiling which had been imposed upon NIH in July. Significant deficiencies throughout the Library came to light during the review. The physical placement of the books and journals, equipment, and staff required substantial modification in order to effect a satisfactory layout. Functional ambiguity, organizational vagueness, dearth of documented, rational policies and procedures were observed. In order to resolve the trouble spots which were closely interrelated, a number of systematic depth studies were initiated throughout the Library.

A reorganization of the Branch was expected to be near completion by the end of the Fiscal Year. A Library Layout Study has been conducted to examine all phases of the layout of the new Library as its shakedown period neared an end. This would identify ways whereby the Library and its collection may be more conveniently and effectively used by the NIH community and the Library staff.

An Acquisitions Study Project was initiated to critically examine the procedures of ordering and receiving in order to develop more efficient methods of operation.

A Circulation and Interlibrary Loan Study Project has as its purpose a detailed analysis of policies and procedures relating to requests received for books, journals, photocopies and Interlibrary loans.

An Acquisitions Scope Project was created to prepare the ground work for the development of a scope and coverage policy statement for the Library's collection.

A Bibliographic Pilot Project studied the problem of providing a concerted Library response to the user needs in this area.

A meeting was held on September 17, in the Office of the Director, DRS, to consider a recommendation contained in the FY 1968 report that "a careful re-evaluation of the role of the Library Committee should be conducted and new guidelines developed." The Library Advisory Committee has been reconstituted with Dr. Hewitt G. Fletcher, Jr., NIAMD, as Chairman. Other members of the Committee include Dr. Matti S. Al-Aish, NICHD; Dr. Roger M. Cole, NIAID; Dr. Clyde J. Dawe, NCI; Dr. James Bosma, NIDR; Dr. Cosimo Ajmone-Marsan, NINDS; Dr. David Shakow, NIMH; Dr. Howard R. Sloan, NHI; and Dr. William B. DeWitt, Acting Director, DRS; and the Chief, Library

Branch (ex officio). The Committee will meet quarterly with additional special meetings to be held as needed. Discussions have covered such topics as the physical layout of the Library, Library hours, identification cards, excessive photocopy requests, the copyright suit against the NIH Library, and scope of the Library's collection.

Cutbacks in Library open hours necessitated by insufficient personnel were agreed to by the Scientific Directors and the Library Advisory Committee. Effective November 2, the Library was closed from 6:00 p.m. Saturdays until 8:30 a.m. Mondays and all day on holidays. Beginning January 12, additional open hours on Sundays and holidays from 1:00-5:00 p.m. were scheduled. The open hours 8:30 a.m. until 12:00 midnight Monday through Friday remained unchanged.

NIH Guards began daytime coverage of the Library on February 3 to ensure that all library books and journals taken from the Library are properly charged.

Legal action of the Williams and Wilkins Company against the NIH Library relating to the photocopy service and copyright law is in the pretrial stage of fact finding. The Department of Justice is handling the case for the Government.

The fifth Medical Librarianship Program for 1968/69 was cancelled due to the reduced personnel ceiling, and the decision was also made to omit the Program for 1969/70.

One of the exhibits on display in the Library was prepared in honor of NIH's Dr. Marshall Nirenberg, one of the Nobel Prize winners in 1968. Another exhibit set up in March was in memory of the late Dr. Jack Masur.

II. BRANCH PROGRAMS

A. Objectives

The primary mission of the Library Branch is to operate an efficient, comprehensive library in support of NIH scientific, medical and administrative programs. Activities of the Library include selection, acquisition, organization, maintenance and circulation of literature pertinent to the programs; operation of a photocopy service; provision of informational, reference, and bibliographical services; and provision of a translating service for foreign scientific and medical literature. To fulfill its mission, the Library is responsive to changing literature needs of the NIH investigators, is knowledgeable of current developments in manual and machine methods of communication and information retrieval, and is alert to adjustment of procedures for improved Library services.

B. Current Programs

Readers Services. Readers Services for the NIH staff include reference and bibliographical assistance, circulation and maintenance of the Library's literature collection, Interlibrary loan, photocopying, and

translation services.

The Reference staff supplies response to questions, compiles short reference lists, and performs comprehensive manual literature searches as requested by NIH investigators. The reference librarians regularly scan current scientific and medical literature and NIH program announcements to keep informed of new developments and activities. They continually search journals, publishers' flyers and catalogs for newly published literature pertinent to the NIH research program and make recommendations for Library acquisitions.

The Circulation staff provides a charging system making available books and journals which may be borrowed. They obtain from other libraries, through Interlibrary loan, literature required by NIH investigators which is not included in the collection. They operate a photocopy service allowing greater use of the Library's journals. They maintain the literature collection to facilitate access by the Library clientele.

The Translations Unit provides translations requested by NIH staff from foreign literatures into English. Eleven languages are handled in the Library; translations from other languages are made available through use of contract services.

Bibliographical Services. The Bibliographical Services staff provides bibliographic assistance involving mechanized information programs for NIH investigators. Experienced searchers formulate requests for MEDLARS computer searches at the National Library of Medicine. The staff keeps abreast of developments in computerized programs of other agencies and organizations, such as the Division of Computer Research and Technology, NIH, Library of Congress, National Agricultural Library, and the American Chemical Society, with a view to possible application by the Library.

Technical Services. Technical Services provides for the acquisition of books, journals, technical reports, and micromaterials by purchase, gift, and exchange which are required to support the NIH research program. The staff organizes the acquired literature through classification, cataloging and subject heading determination and processes it for inclusion in the collection. The staff is responsible for listing of book/journal acquisitions, maintenance of the catalog, and preparation of completed journals for the commercial binding. Some procedures have been automated, and printed output is obtained from the NIH computer.

C. Program Progress and Accomplishments

After Mr. Jess Martin's departure on July 10, Dr. William B. DeWitt served as Acting Chief, LB, until the arrival on August 19, of the newly appointed Chief, Seymour I. Taine.

Stringent personnel limitations were in effect throughout the year, and vacancies created by resignations remained unfilled. Fortunately, funds were obtained for provision of overtime to assist in reducing backlogs which developed in many areas. Permission was granted to fill two crucial

positions, one in Photocopy and one to keep the Library open for 4 hours every Sunday and each holiday. It was also possible for the Library to obtain two Commissioned Officers, one permanently and one on loan from an Institute. These personnel have been of great assistance in the execution of the staff studies previously mentioned. Recruiting was authorized in April to fill four positions with the provision that the selected personnel be on duty by June 30.

The fifth Medical Librarianship Program for 1968/69 was cancelled due to the reduced personnel ceiling, and the participants who were to enter on duty were notified on the cancellation. Decision was made to eliminate the Internship Program for 1969/70. It is hoped that the Program will be resumed for 1970/71.

NIH Guards began daytime coverage of the Library on February 3, replacing the checkpoint manned by a Library staff member. Briefcases, packages, and all NIH Library books being taken from the Library are examined to ensure that all Library books and journals have been properly charged. The Desk attendant continues to examine briefcases after hours when the Guard is not on duty.

The Library Layout Study has had as its objective the identification of ways whereby the Library and its collection may be changed in order to be more conveniently used by the NIH community and the Library staff. Many suggestions were received from Library users, the Library staff, members of the Library Advisory Committee, and others. Dr. Frank B. Rogers, Librarian of the University of Colorado Medical School Library, and former Director, National Library of Medicine, served as consultant for the proposed renovations. Drawings were prepared by a consulting architect, from a final version of the many floor plans which were prepared, reviewed, and revised. Renovations are expected to be underway by September and completed before the end of the calendar year.

Training of the Library staff included course work in history of medicine, endocrinology, mathematics, public personnel administration, human relations and behavior, reading improvement, and information storage and retrieval. Library non-professional staff took courses in various library subjects, reading improvement, medical terminology, scientific writing, and machine operation and wiring. Short seminars and workshops attended by staff members include: DRS course on "Effective Supervisory Leadership," NIH Seminar on Troubled Employees, NLM MEDLARS Workshop, NLM orientation on "Library Network Development Plans," Library of Congress MARC Institute, "Federal Budget Processes," and "Management and the Negotiated Agreement." The Training Officer, DRS, presented a series of five films early in the year to the Library's management group dealing with interpersonal relations and management.

A box was placed on the first level of the Library in March to receive suggestions from Library users. Many constructive suggestions for improvements in the Library have already been received. Personal acknowledgments have been made by the Chief, LB, to those who signed their names.

The pending copyright suit of Williams and Wilkins Company against the U. S. Government and the NIH Library relating to infringement of copyright law in the photocopy service is presently in a fact finding stage. This is the first legal action to test the principle of "fair practice" under which research libraries duplicate a single copy of a journal article for research purposes. On February 26, the Chief, LB, gave a 4-hour legal deposition at the Department of Justice which is handling the case for the Government.

Agreement between Dr. DeWitt, Acting Director, DRS, and Dr. Pratt, Director, DCRT, was reached for the modification of NIH Library services to the DCRT Library due to NIH Library personnel shortages. Discussions were held with the new DCRT Librarian, on November 27, concerning the transference of certain activities to DCRT. Photocopy, translating, and MEDLARS services will be provided DCRT personnel by the NIH Library as formerly.

The Chief, LB, has served as a member of DHEW's Career Service Board for Library and Information Sciences, as Consultant in planning the new NICHD library. He is the Medical Library Association representative on the Advisory Board of the National Translations Center at the John Crerar Library in Chicago and also its representative for the Neurological Information Network supported by NINDS. The Assistant Chief, LB, served as Secretary/Treasurer of the Joint Committee on Library Education, Council of National Library Associations. She is the Secretary of the Agriculture and Biological Subsection, Subject Specialist Section of the College and Research Libraries Division, American Library Association, and is a member of the Recruiting Committee, Special Libraries Association, Washington Chapter. The Chief, Readers Services Section, is a member of the Committee on Scholarship, Medical Library Association. The Chief, Technical Services Section, serves on the Editorial Committee for Vital Notes of the Medical Library Association.

During the year the Chief, LB, visited a considerable number of major medical libraries throughout the country to obtain suggestions and ideas on layout, services, and procedures which might be incorporated into the NIH Library for more effective service. Libraries visited included: Upstate Medical Center Library, State University of New York, The Francis A. Countway Library of Medicine of Harvard University, Yale Medical Library, New York Academy of Medicine, New York University Medical Center Library, College of Physicians Library, Welch Medical Library of Johns Hopkins University, Washington University School of Medicine, medical libraries at USC, Stanford, the University of California at Los Angeles, Santa Cruz, and San Francisco, and the National Lending Library for Science and Technology, Boston Spa, England.

One or more professional members of the Library staff attended the following meetings in addition to meetings held in the immediate area: American Chemical Society, American Library Association, American Society of Information Science, Clinic on Library Applications of Data Processing, Third International Congress on Medical Librarianship, and Washington, D. C. Area Medical Library Group, National Federation of Science Abstracting and Indexing Society.

Readers Services

Three Library staff members now have the responsibility on a rotating basis of keeping the Library open on Saturdays with the support of a stacks maintenance man. A non-professional has been appointed to keep the Library open 4 hours on each Sunday and each holiday. Coverage is provided from 8:30 a.m. until 12 midnight Monday through Friday, 8:30 a.m. until 6:00 p.m. Saturdays, and 1:00-5:00 p.m. Sundays and holidays.

An overtime program provided appreciable help to the Section in reducing backlogs in photocopy, stacks maintenance and translating which have developed due to personnel shortages and increased requests for services.

Thirty locked carrels were completed on the lower level of the Library in August. The carrels are available for short-term literature research and are assigned for a 2-week period with renewal possible. The Chief, Readers Services Section, is responsible for carrel assignments.

Photocopying Service. Xerox 720 and 914 photocopiers are used to provide immediate copies of journal articles of 20 pages or less. Longer and less urgent articles are photographed on the Recordak camera, processed at NLM and printed on the Xerox Copyflo. Approximately 90,000 pages are photocopied monthly for NIH investigators. One NIH staff member serves one-half time at NLM to assist in providing rapid photocopying for NIH Interlibrary loans.

Circulation. A total of about 57,000 books and journals were borrowed by the NIH community during FY 1969. Approximately 7,000 items were loaned to other libraries, and 11,500 were borrowed from other libraries for use by NIH investigators. About 2,600 copies of NIH translations were requested by NIH staff and some 1,100 were loaned to other libraries upon request. A copy of each NIH translation is sent for deposit at the National Translations Center operated by the John Crerar Library in Chicago.

The Circulation and Interlibrary Loan Study Project was designed as a critical examination of each procedural step in filling requests for books, journals, photocopies, and interlibrary loans. The most effective procedures have been identified and flow-charted.

Explorations of the feasibility of an NIH Library identification card have been made. Pros and cons of the use of such a card, library services for which it might be used, type of card, and methods of distribution have been carefully studied. The target date for the initiation of the new ID card system is the early part of FY 1970.

Reference Service. Personnel, DRS, has completed desk audits of the position descriptions and actual functions for the Head of the Unit and the three senior Reference Librarians.

Studies of the Abstract-Index and the Reference collections on the first floor have been made to determine the specific placement of these two classes of materials for most effective use of space on the two levels of the Library.

Translating Service. Approximately 500 written translations were completed; of these some 90 were handled by outside contractors. Almost 400 oral translations were made and 90 recordings provided. The translators have at present a capability for eight languages. For other languages and for translations over 40 pages contract awards were made in September to four translating organizations and to one individual translator.

Technical Services

The overtime program was beneficial in reducing backlogs in ordering and binding.

Acquisitions. During FY 1969 some 4,200 books were added to the Library's collection through purchase and about 750 volumes as gifts and exchanges. Approximately 2,300 journal subscriptions were placed with 800 added through gift and exchange.

The Acquisitions Study Project was underway from November through June. All details of procedures, flow of material, personnel, and other facets of acquisitions activities were analyzed and flow-charted.

The FY 1969 DHEW binding contractor has proved to be highly unsatisfactory. A memorandum was forwarded to NIH Quality Control, SMB, identifying such faults as defects in quality, loose sewing, insecure end papers. Other DHEW libraries are experiencing similar difficulties.

Periodicals Currently Received in the NIH Library 1969 includes additional data for each title, such as date of the Library's earliest holdings, language, title cross references and a more convenient subject section. This publication has been removed from the PHS numbered publication series and is available only for administrative (internal) use.

Cataloging. A systematic review was made of the PHS numbered publications to locate those which were never cataloged and to complete them. A special effort was made to reduce the backlog of the technical reports of work performed under NIH contract. The Library had been designated a depository (PPM Public Information No. 4) with agreement for a listing in The Booklist. Mrs. Helen Potter Hilleary, Head, Cataloging Unit, was awarded a Quality Increase on January 21.

Bibliographical Services

During FY 1969 some 830 MEDLARS requests from NIH investigators were formulated, sent to NLM for a computer printout, and released to the requester.

A User Education meeting was held in the Clinical Center Auditorium on July 12, at which about 200 NIH investigators were present. Small group sessions were set up by subject interests. Considerable interest was expressed in this type of orientation by those who attended.

D. Problems

Problems are many, some more serious than others, thus suggesting that an order of priority is needed to lend perspective and orderliness to the strategy needed to tackle them. The most urgent situations have already been attacked and at this point appear to be on their way to resolution or at least amelioration. The most serious and longer term problem that will be with us perhaps throughout Fiscal Year '70 is in the personnel area where the need for dynamic, able, professional staff is daily made evident. Many of the other problems may well be removed as a consequence of an improved personnel picture.

E. Program Plans

Implementation of the policy and procedural changes resulting from the various studies undertaken this year is planned for the early part of Fiscal Year '70. Considerable personnel adjustment is anticipated as the new approaches are introduced and integrated into the operation of the Library. The need for further organizational modification may become necessary in the coming year, and planning for such a course of action has indeed been anticipated.

A second phase in the modification of the Library layout is also projected and is expected to be undertaken when the necessary resources become available.

F. Publications

National Institutes of Health Library: NIH Library Booklist, Bethesda, Md., monthly.

National Institutes of Health Library: Periodicals Currently Received in the NIH Library 1969. (Internal use only)

National Institutes of Health Library: Recent Translations, a Selected List. Bethesda, Md., monthly.

Summary of Branch Activities July 1, 1968 through June 30, 1969

MEDICAL ARTS AND PHOTOGRAPHY BRANCH Charles C. Shinn, Chief

I. SUMMARY

The Medical Arts and Photography Branch provides for visual communication of research information obtained at NIH, for preserving observations of NIH scientists, for recording research activity, and for preparing effective visual material for research reports.

Professional designers provide not only visual presentations such as motion pictures, slides, exhibits and publications, but counsel and advice on selection of appropriate visual media and effective methods for achieving desired results.

With cutbacks in personnel and budget, major emphasis this year was on (1) improving and establishing production standards, (2) streamlining work methods, (3) training, (4) achieving modest reorganization, and (5) capitalizing upon the move of MAPB Sections from dispersed locations to centralized quarters. Concurrently a number of policies and administrative procedures were established to make it easier for NIH researchers to acquire services, to consolidate effort and talent, to achieve total production within MAPB and to deliver work within required time schedules. Record keeping and identification of overloads were made easier. A system of cross identifying requisitions reduced the number handled while a greater volume of work was achieved.

In August, the Branch moved to its new central location in the Library Annex of the Clinical Center. Immediate improvement was achieved by centralizing work reception, telephone communications, branch files, and typing and clerical services in a new Work Administration Unit. Controls were set up to measure work flow and volume. This resulted from a successful task force study of work reception and control. The task force was composed of personnel directly involved and experienced in past methods of work handling. However, newly acquired personnel with special skills in industrial design (work flow, space analysis, and design) and administration added their knowledge to the effort. Supervisors then met and approved the task force recommendations.

In addition to creation of a Work Administration Unit, a shift of draftsmen and technical illustrators to the General Illustration Section was achieved. This created a larger, more flexible pool of talent under single supervision, which now can be shifted to meet changing production demands and overload situations. An improved career ladder for employees from lower echelons was also provided.

Further consolidation and improvement through reorganization in the photographic and visual design programs is in the planning stage.

A. Objectives

The objective of the Branch is to provide consultation and production services to the NIH; to visually communicate program effort and research results; to provide knowledge, skills and techniques in visual design, medical art, applied arts, still photography and cinematography for solving problems of recording, communicating and presenting research activity and expressing program information to the scientific community and to the public; and to investigate, develop and apply new visual techniques.

It is also the objective of the Branch in meeting NIH research program needs, to provide in-house services on a professional basis competitive with commercially obtainable services at the lowest possible cost, and to develop specialized capabilities, particularly in still photography, cinematography, and medical arts, tailored to NIH needs.

The Branch monitors procurement of art and photographic services by outside contract, serving as technical adviser and counsellor in obtaining the needed additional services at the lowest cost consistent with high quality.

B. Current Programs

The programs of the Branch are still and motion picture photography including photomacrography, photomicrography, time-lapse and high-speed cinematography, general photography, and related laboratory services; visual arts production including publications design and general graphics; visual aids including slides, vu-graphs, and other projectables; animation art work; technical, general, and medical illustration; exhibit design; statistical drafting, display charts; medical models; and computer generated graphics.

C. Program Progress and Accomplishment

Production Standards and Streamlining Work Methods

Following minor improvement last year, a comprehensive task force study of art work standardization was concluded. The study established standard art work production sizes within proportions consistent with photographic slide, TV and motion picture standard projection formats. Many extraneous variables were eliminated. The results are more unified production, increased economy in manpower and materials, and higher quality. A pamphlet and a poster were produced to inform researchers of the need to standardize plotting and arrangement of rough materials submitted for production. As this becomes better understood by clients, further benefits will result.

A system for mass producing charts and graphs primarily for briefing and congressional presentation was developed. Artists may now work on various parts of the finished production within a pre-determined format. This has drastically reduced production time, yet the final charts are of higher quality in a consistent style of NIH generated materials. At the same

time, color materials were pretested and standardized so that finished work might be reproduced in either color or black and white with pre-determined readability. In addition to the colors, type sizes were also analyzed and standardized for optimum readability. Large headlines for 30 x 40 charts, heretofore produced manually, are now produced mechanically allowing greater speed and flexibility of production within the standardized system.

A job jacket was developed, designed, printed and put in use by the Work Administration Unit. Materials coming to the Sections are contained in the jacket which follows the job through the various Sections to completion. By means of a check-off list and notations by Section Chiefs, designers, artists, photographers, etc., a complete record is obtained. For the first time, this will be available for future reference when work is re-run, expanded, or revised. The data obtained is also valuable in on-going work flow measurement and analysis.

In concert with the NIH Printing and Reproduction Section, sizes of publications produced in-house were standardized. The standards are based on printing equipment available at NIH. Copy preparation, art work and designs within these standards has resulted in greater economy of manpower with more complete utilization of available printing equipment.

A task force was established to refine and modernize the photographic library system. Though some weeding out was achieved with summer help, an entirely new photographic negative and print filing system is needed with new approaches to subject categories and standards for retention. This will be a continuing study. Concurrent with this effort, permission has been obtained from the OD, CC, to reduce the voluminous files on patient photography by sending dormant material after three years to the Federal Repository.

A quality control system for photographic color film processing was established resulting in better and more consistent quality. Color reproduction faithful to original specimens is markedly improved.

Another task force worked with the Division of Computer Research and Technology to develop basic knowledge and skill in production of computer generated charts and graphs. Several experimental programs were developed. Early results show great promise and improved quality of the visual printout for handling simple large volume statistical charts, releasing draftsmen for necessary handwork on complex or unique charts and for more creative work.

Administrative Improvements

A system of monthly objective reporting by Sections and by the Branch Office was established. Project objectives are set in the Sections, a project officer assigned and a target date established for achievement in six months (short range) or one year (long range). A monthly appraisal of the status of projects is made and visually posted to keep objectives and progress constantly in sight. To date, the system has resulted in timely achievement of many of the following improvements.

A more efficient stock control system establishing maximum and minimum stock levels was implemented. This will achieve greater control of stocks, reduce administrative time and provide information for more precise projection of future expenditures.

Contract assistance was analyzed and a method of bulk contracting during the peak period of Spring Federation meetings was developed which eliminated the need for additional personnel. Though heavy overtime schedules were necessary, the bulk contracting technique, using more contractors, kept the overload within reasonable bounds, allowing maximum staff utilization short of over-stressing production personnel.

Inspection of contract work resulted in a significant increase in photographic quality from a greater number of available photographic contractors. Savings of $1,224 were identified between the period December, 1968 and April, 1969 through use of new contract facilities.

MAPB initiated discussions with the Supply Management Branch to clarify MAPB's role in clearing requests for outside procurement of photographic and art services. A mutually acceptable procedure will be developed early in FY 1970.

The photographic work request form was revised. Materials expended are recorded as work is accomplished, leading to more accurate projections for purchase and budgetary control.

As a result of establishing an inventory control system, a preventive maintenance contract is being developed to keep photographic equipment at peak efficiency and to predict and plan for obsolescence. It is not anticipated that this program can be put into effect before FY 1970.

The Management Analysis Section placed the General Illustration Section on the end product reporting system. Pending work and backlogs can be more accurately converted to standard manhours, resulting in more accurate forecasting of workloads and manpower requirements, while minimizing record keeping by individual designers and artists.

Other major administrative improvements include renovation of the photographic laboratory to improve work handling and to better accommodate administrative and clerical personnel, elimination of the old photographic work reception area; installation of more efficient copy camera equipment; internal training seminars; establishment of a medical illustration file; establishment of a work locator and status system for responding to client inquiries.

Completion of Centralized Branch Facilities

Following the move of MAPB to centralized quarters, a consulting sound engineer developed a design for soundproofing a small motion picture recording studio. The contract has been let for construction with completion of the facility anticipated in the first quarter FY 1970. This will eliminate 90 percent of the need to rent outside recording studio time, improve motion picture production and streamline services. The studio will also make patient photography more secure and enlarge other services which

require a sound recording facility. This is the final, major construction required for a basic visual communication facility.

Program Performance

Motion picture footage increased from 87,000 feet to just over 100,000 feet in FY 1969. Total internal photographic print production decreased due in part to careful screening of requests, to reduced personnel, and to increased use of contract services.

Improvement in the use of a teleprompter in motion picture production was achieved by designing and constructing special apparatus.

Acquisition of a new single and double system Arriflex BL Camera improves speed in making motion pictures and provides wider options for the researcher. With direct sound on film by magnetic striping, the researcher now has the opportunity of seeing and hearing research results within 24 hours.

Following is a list of the more significant motion pictures completed during the year:

"Isotope Cisterno Ventriculography". This motion picture research report won first prize of $1,000 at the annual meeting of the Society of Nuclear Medicine. It is 16mm,color, sound, 24 minutes in length; produced for the Section of Neuroradiology, NINDS.

"Gift of Life". This information film on the artificial kidney was released and has been presented on television. It is 16mm, color, sound, 28 minutes in length; produced for NIAMD.

"Spinal Cord Angiography". This 16mm, color, sound film, 24 minutes in length for NINDS was the principal presentation of the First International Symposium on "Angiography of the Spinal Cord and Canal" held at the Royal Society of Medicine in London on May 1, 1969.

A re-edited short version of "Extended Resection of Basal Cell Carcinoma of Scalp, Brain and Face" was produced for NCI. This will be shown at the annual meeting of the American College of Surgeons. It is 16mm, color, sound, 10 minutes in length.

"Surgical Correction of Vascular Obstruction of the Superior Infundibulum". This will be shown at the annual meeting of the American Urological Association in San Francisco. It is 16mm, color, sound, 21 minutes in length; produced for NCI.

"Life Cycle of the Tick", 16mm, color, sound, 15 minutes in length, and "The Story of Rocky Mountain Spotted Fever", 16mm, color, sound, 30 minutes in length, were updated, fully edited, musically scored and voice recorded by MAPB for NIAID in cooperation with a private contractor.

"Neurological Information Network", two versions of an 8mm,animated color, sound film, $4\frac{1}{2}$ minutes in length; produced for NINDS.

"Experimental Calf Surgery", 16mm,color, sound 20 minutes in length; produced for NHI.

"Implantation of a Radio Frequency Corotid Sinus Nerve Stimulator for Relief of Angina Pectoris". This 16mm,color, sound film, 18 minutes in length, based on the promising clinical results obtained by NIH scientists on the application of a device for angina pain, was selected by the U. S. Information Agency from numerous applicants to represent this country. It was one of the entries chosen for showing at the Festival International du Cinema Medical held in Nantes, France. Application of this device has allowed a number of patients to resume a relatively normal life after years of enforced inactivity.

From time-lapse photomicroscopic footage, a formal 16mm, sound, color, film, 8 minutes in length, titled, "Development of Mouse Submandibular and Sublingual Salivary Gland Rudiments in Organotypic Culture" was produced for NCI.

A noteworthy accomplishment in the medical illustration program was a series of drawings of anomalies of skeleton and musculature of the newborn, aimed at defining variations from the normal. This work is related to an NIDR project entitled "Studies of Oral and Pharyngeal Form and Function in Infants". Thirty-seven anatomical half-tone plates will appear in a general volume entitled "The Mouth and Pharynx of the Human Infant".

Another noteworthy project was production of approximately 75 drawings of congenital malformations of the heart and great vessels. This project, performed for scientists in the NHI, will ultimately be published in a small handbook entitled "International Classification of Heart Pathology in Children". The project is related to a proposed international classification of heart diseases in children, prepared in cooperation with the American Committee on Coding and Classification, the Committee on Nomenclature and Coding of the Association of European Cardiologists, and the Paediatric Cardiology Council of the International Society of Cardiology.

Technical guidance provided to researchers in operating photographic equipment in the laboratory increased. Ultraviolet fluorescent techniques involving multiple exposures and infiltration procedures were developed and improved.

2 x 2 slide production continues to increase while $3\frac{1}{4}$ x 4 lantern slides decrease.

Purchase of a modern IBM Selectric Composer and IBM proportional spacing machine have increased work potential in this area by at least 50 percent. Typography composed for all forms of graphic presentation result in cleaner photographic enlargement and reduction. Quality is perceptibly enhanced.

Increased workloads generally have been successfully absorbed although overtime has been required to cope with extra work from the Health Services and Mental Health Administration, the National Library of Medicine, Office of the Surgeon General, Bureau of Health Professions Education and Manpower Training, and, the Office of the Secretary, DHEW.

Training

Concurrent with consolidation and general improvement in Branch activities, technical and administrative training were emphasized. Forty-nine opportunities for outside training (29 at no cost to the Government) were provided to 31 employees. Training included short term, two to three day seminars, and programs spanning one year. Some individuals had more than one opportunity. Both skill improvement and preparation for future needs were covered.

In addition, a series of Employee Development meetings were held for supervisors and key Branch personnel to improve communications and to clarify roles in the MAPB team effort.

D. Problems

Reduction in personnel and increased difficulty in finding qualified replacements continues. While outside contract services help meet production demands and, on occasion, provide highly specialized requirements, maintenance of a minimum staff with diversified talents is essential. A relatively low pay structure limits our ability to attract highly qualified personnel for critical areas. Of necessity, the silkscreen operation, high speed photography and some time-lapse photography have been curtailed.

An interim plan is being developed for part-time sharing of a BEIB engineer to work on electronic problems related to high-speed photography and sophisticated sound recording. A more intense problem will occur when the motion picture sound studio facility is fully operational. One apparent solution is adding a full-time sound engineer to the staff.

MAPB was hit by an abnormal number of long-term sick leave absences. Also, a high proportion of the staff is approaching retirement. New young talent is needed with emphasis on formal education in the arts and on up-to-date technical training. Improved attitudes of present personnel must be developed to effectively mesh newcomers with contemporary ideas into our programs.

While new, improved, automated photographic equipment has provided a partial answer, it cannot satisfy demands for custom production specifically critical to research effort. Standards across the board must be raised. Motivation to produce quality, to question, and, at times, reject the mediocre must take place. A continuing internal effort, supplemented by external training, is planned to meet these goals.

Improvement in the aspirations of clients for higher quality graphic and photographic work must be encouraged. The present photographic laboratory, which has developed piecemeal over the years, should be updated by a major rearrangement, reconstruction and rehabilitation of the space and equipment. Plans are presently being drawn with the help of consultant specialists to accomplish this in the coming fiscal year. At present we are behind in technical knowledge and development of more sophisticated photography and visual presentation. There is no reserve capacity in some specialized skills.

Administrative support personnel required to efficiently complete filing, answer telephone inquiries, control supplies and work flow, inspect, modify, and maintain equipment, and to perform other related tasks are now below minimum needs. Although training can accomplish some improvement, additional hands are needed which could actually cut costs through improved efficiency.

The problem of communicating the broad range of MAPB services, especially to new personnel arriving at NIH, will be emphasized through regular channels. In addition, an MAPB exhibit, a short orientation motion picture and other information materials are planned. They will be completed in FY 1970, so that researchers can visualize the professional contributions available early in developing their programs and in designing specific research efforts.

E. Program Plans

Efforts will continue toward the planned reorganization and, through the objectives reporting system, to increase supervisory effectiveness, to enhance motivation generally, to accentuate forward motion and to further streamline performance by individual technicians.

In FY 1969 ten individuals received external and internal awards of recognition and/or incentive awards for performance. Supervisors will be encouraged to use the incentive program to officially and tangibly recognize outstanding performers.

Increased involvement by supervisors and designers with researchers will be further encouraged by training, by intimate Branch participation in specific projects and by improved client relationships to go beyond regular delivery of products to ideation and problem solving. Awareness of modern techniques and identification of long-term applications of the visual arts to research will be encouraged.

A proposal for retention and archiving all original motion picture production footage is planned for the coming year. This will eliminate loss of valuable original footage, which in the past has been sacrificed to expediency. This will depend on improved internal policy and on more precise production classifications, separating those efforts which have continuity from those that have day-to-day transitory application.

Systems to prevent obsolescence of personal skills and equipment through advance planning and training will be established. Faced with continuing reduction of personnel and budget resources, this represents a way of meeting significantly increasing service demands on MAPB.

Problems of internal communication and in communicating researcher needs to outside contractors exist. These will be dealt with by assignment of personnel at the Branch level to overcome specific problems identified in this area.

F. Publications and Patents

Feedback on the prototype high-speed camera exposure computer designed in FY 1968, is not complete. Clarification of the patent potential of this unique device which speeds up and simplifies calculations for obtaining high-speed camera exposures has not been obtained.

Two papers, "A Method for Making Accurate Medical Moulages" and one on a soft plastic "Eye Model" will be completed in FY 1969. Release of the papers is anticipated in early FY 1970.

DIVISION OF RESEARCH SERVICES

Summary of Branch Activities July 1, 1968 through June 30, 1969

PLANT ENGINEERING BRANCH S. W. Oliver, Chief

I. SUMMARY

During FY 1969, the Plant Engineering Branch met all basic service demands although increased workload and reduced manpower caused some delays in completing customer work. Mandatory personnel controls prevented the planned enlargement of the staff and prohibited the filling of all vacancies as they occurred. As of March 31, 1969, the Branch had eight employees less than as of July 1, 1968. With the completion and occupancy of Buildings 31C, 35, 36, 37 and 41, the PEB workload increased substantially and manpower shortages reduced responsiveness on completion of station labor program alterations and forced a reduction in the level of maintenance of grounds, roads and walks.

New equipment was placed in operation which increased the capacity of the central air conditioning system by nearly 50%. Completion of the installation of a fourth boiler in Building 11 increased steam generating capacity by one-third.

Diesel emergency generators were installed at the older laboratory buildings to increase capability of carrying essential loads in the event of a major power failure.

II. BRANCH PROGRAMS

A. Objectives

The mission of the Plant Engineering Branch is to provide responsive support to the medical research mission of the National Institutes of Health by fulfilling, as expeditiously and as economically as possible, the functions described below.

B. Current Programs

Operation and Maintenance: Consists of operation and maintenance of the NIH physical facilities including buildings, grounds, utility systems and equipment.

Engineering: Consists of consulting engineering services in support of operational aspects of major engineering facilities, such as buildings, the central power plant, central air conditioning system, incinerator, all utility systems; and design of landscaping projects.

Construction: Consists of providing station labor craft services for altering, repairing and improving NIH facilities.

C. Program Progress and Accomplishments

Work Performed by Station Labor: Requests for PEB services are received in the form of written work requests and by telephone. Telephone requests for minor services such as clogged plumbing, electric lamp replacements, malfunctions of heating and air conditioning systems and utility leaks are received by three decentralized area maintenance units. All written requests are received in a central work reception office. In addition to processing requests for work to be accomplished by PEB, the work reception office also serves as the central formal reception point for all facilities engineering work involving the Division of Research Services, which includes major new construction accomplished by contract, both GSA contracts and direct NIH construction contracts.

Telephone requests during FY 69 continued to average about 1500 per week, and the number of written work requests averaged in excess of 300 per week. Almost all telephone requests and about sixty percent of the written orders require little or no formal planning (design drawings, specifications, special-order material or detailed labor estimates). About one percent of the written work requests, however, require professional engineering assistance for formal planning, and most of these projects are performed by private contractors rather than by station labor. Requests requiring professional engineering are referred to the Engineering Design Branch. Projects to be accomplished by NIH contract are referred to the Construction Engineering Branch for contract administration.

No additional personnel were employed during the year for station labor shop activities. A review of material expenditures, one measure of worker productivity, indicates that gross work output remains high.

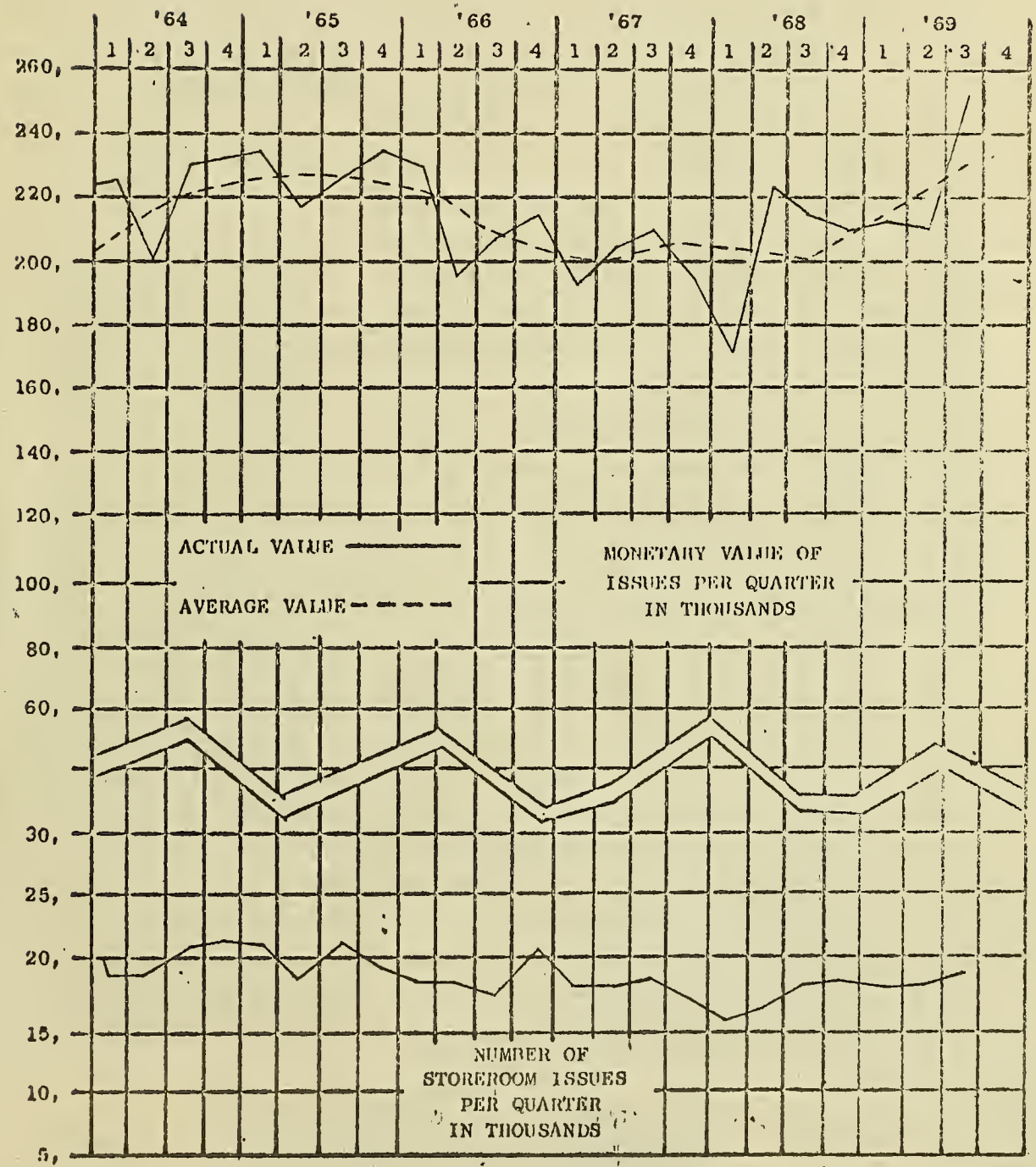
Chart I reports material expenditure trends by quarter since 1963. The dollar value of material expenditures during FY 69 continued the upward trend begun in the previous year, with a sharp upward turn in the second quarter of FY 69. Final reports for FY 69 material, if the trend existing as of March 31, 1969 continues, could reach an all-time high for the final quarter.

A good measure of the adequacy or responsiveness of the service performed by station shops is the work remaining in backlog. Some backlog is desirable to provide flexibility in scheduling to adjust for unforeseen work conditions. Experience has shown that a backlog averaging eight weeks of work will allow the most responsive service which can be given without sacrificing efficiency. Charts II and III show the backlog trend for the central craft shops since August 1966. The backlog began a marked increase in the second quarter of FY 69, and reached an all-time peak of 16.5 weeks for the week ending February 21, 1969. This increased workload was associated mainly with the problems of occupying new Buildings 31C, 35, 36, 37 and 41, as well as large shifts of offices resulting from the major NIH reorganization which occurred

NATIONAL INSTITUTES OF HEALTH
Division of Research Services - Plant Engineering Branch

MATERIAL SUMMARY

Quarters (fiscal year)



DOLLARS IN THOUSANDS

ISSUES IN THOUSANDS

CHART I

NATIONAL INSTITUTES OF HEALTH
DIVISION OF RESEARCH SERVICES - PLANT ENGINEERING BRANCH

SHOP WORK BACKLOG SUMMARY

Reporting Period August 1966 thru December 1967

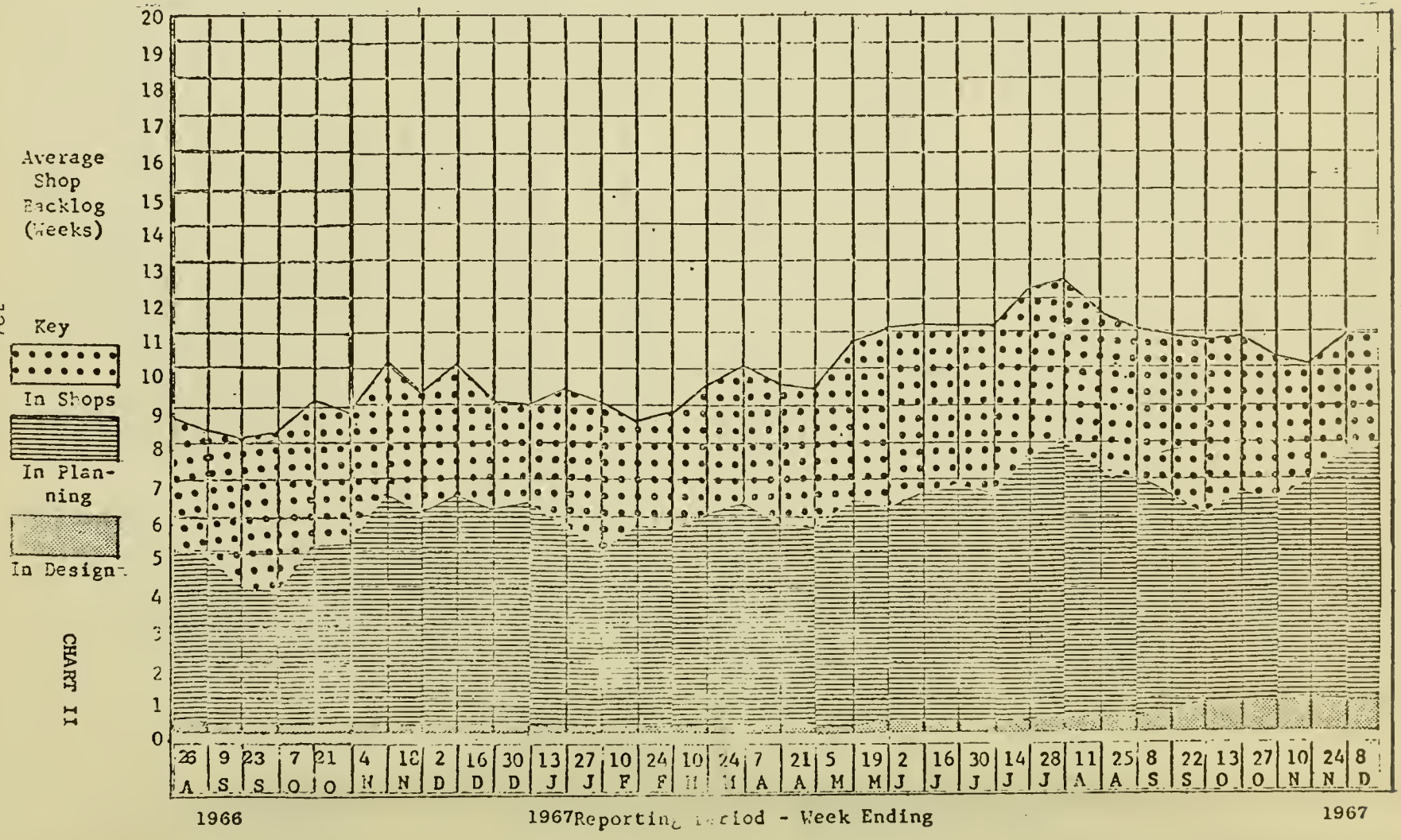


CHART II

NATIONAL INSTITUTES OF HEALTH
DIVISION OF RESEARCH SERVICES - PLANT ENGINEERING BRANCH

SHOP WORK BACKLOG SUMMARY

Reporting Period December 1967 thru March 1969

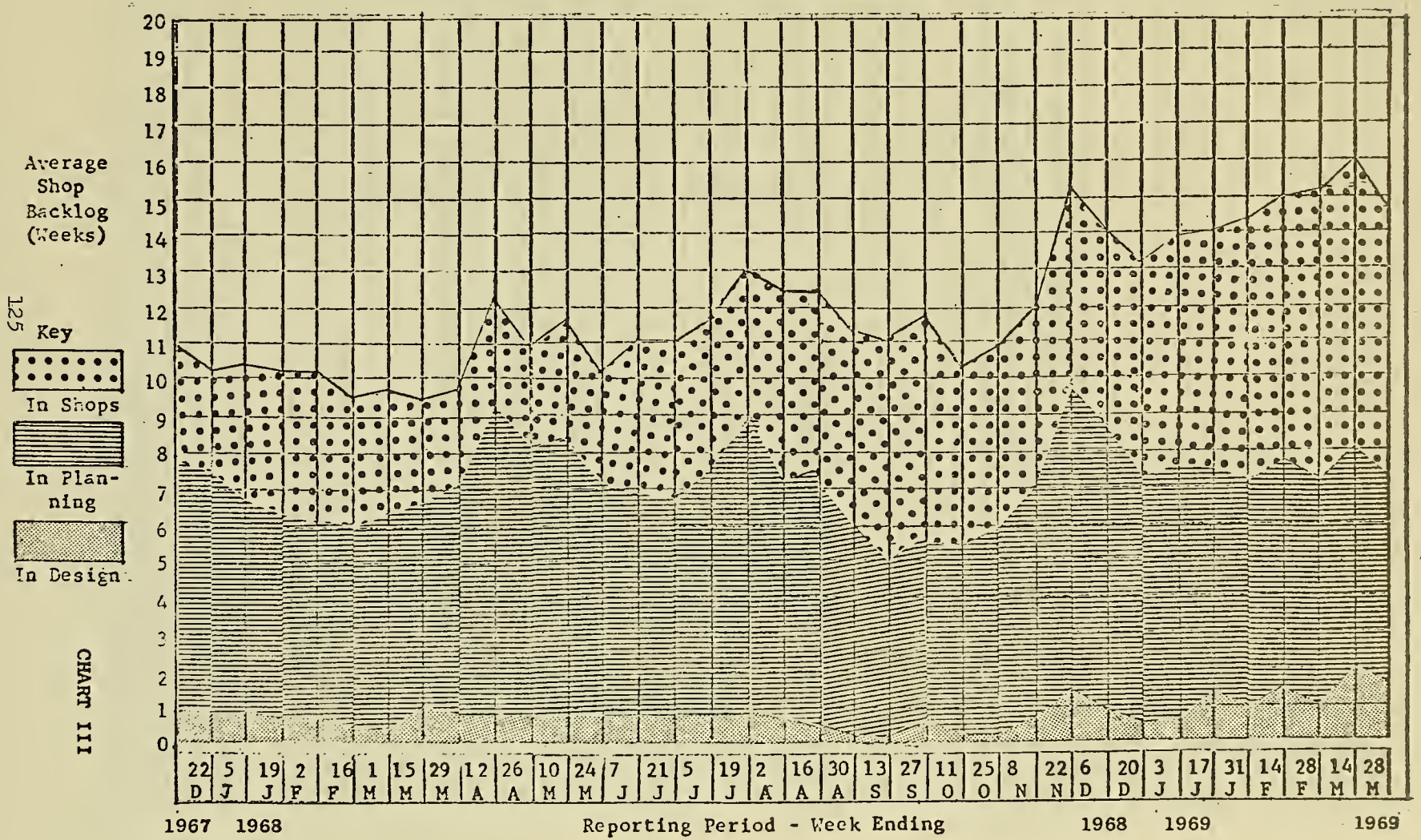


CHART III

early in the year. Substantial use of overtime work was authorized to minimize delays in completion of important projects. As might be expected under these conditions, some complaints from program were received but by and large the program areas generally were sympathetic and understanding of the problem, being fully aware of the ceilings on personnel which had been imposed.

The authorized personnel ceiling for the PEB craft shops has been decreased by seven positions since 1962. During this period additional new buildings have been occupied increasing the gross square footage of space by more than 40%.

Building 31C: Occupancy of the extension of the General Office Building,31C, began in February 1969, although construction of the building was not fully completed. Mechanical equipment and utility systems were accepted for PEB operation in April 1969. Occupation of this building resulted in an extremely heavy workload for partition rearrangements in various buildings to accommodate the many moves of personnel from one area to another. The general plan which was followed was to make the minimum number of changes necessary to permit access by the new occupants, with final work on appearance items, i.e., painting, to be done later, when time and labor would be available.

Building 34 Chilled Water Plant: During the year this building was completed and two 3,000 ton Worthington air conditioning units were installed and connected to the central chilled water distribution system. These machines were tested in April, and bring the total NIH central air conditioning capacity of the plant to approximately 20,000 tons per day.

Buildings 35, 36 and 37: In September 1968, Building 36 was turned over to NIH for occupancy and for operation, maintenance and repair of the mechanical equipment and systems in the buildings. In October, Building 37 was accepted for operation, maintenance and repair of mechanical equipment. In November, Building 35 was turned over to NIH for occupancy and for operation. Many defects and omissions were corrected by the contractor and much work was done by PEB to make the buildings liveable for the occupants. Much work yet is to be done in these buildings not only as a result of the renovations now taking place but also to continue to correct problems which occur in the buildings. These buildings incorporate a number of new design concepts which had been expected to result in some problems during the shakedown period.

Building 41, Virus Facility: In April 1969, this building was accepted by NIH for operation and maintenance except for the low temperature chiller and the waste treatment equipment.

During the six months prior to acceptance, PEB assisted in the testing of the exhaust systems for leaks. Approximately five men were detailed continuously for a period of over two months to test these systems so that the contractor could make necessary repairs. This building is a high-hazard facility with many design innovations to provide reliable containment features for pioneering research work in seeking cancer causes and cures.

Power Plant Noise Problem: For several years the NIH Employee Health Unit has been checking the hearing of employees in the Power Plant to determine whether there was any hearing loss caused by noise in this area. Although the tests were not completely conclusive, it was felt that as a precautionary measure all employees in the Power Plant should wear ear protection when working in certain areas for extended periods of time. As a result, all Power Plant employees were issued ear plugs and instructions for their use. Other PEB employees are issued protective devices, when required, when working in the noisy areas.

Maintenance Unit Relocations: In November the South Buildings Unit moved from Building 13 to basement mechanical room space in Building 37. This move became necessary to provide increased space in Building 13 for other engineering activities as a result of the reorganization of DRS engineering functions in December 1968. The North Buildings Unit is scheduled to move from Building 13 to the B1 level, Building 31A, early in FY 70. In addition to freeing up needed space in Building 13, this move will provide increased space and facilities for the Unit, located more conveniently to their work area in the north group of buildings.

Underground Chilled Water Loop System: During the year the underground chilled water loop distribution system was completed. The east loop now serves Buildings 1, 2, 3, 6, 12, 12A, and 31 and the west loop serves Buildings 34, 35, 36, 37 and enters the west end of Building 10. The loop system is designed to serve future additional buildings on the reservation.

Steam Distribution Loop System: The steam loop distribution system similar to that of the chilled water distribution system was completed and put into operation. Minor problems still exist on this system but are in process of correction.

Chilled Water 3-Way Valve Replacement: The replacement of all the 3-way chilled water valves by 2-way (straight-through) valves on all the cooling coils in the buildings of the reservation was completed. With this system the flow of chilled water around the reservation during low load conditions has been greatly reduced. The savings in pumping power and wear and tear on the large air conditioning machines will be appreciable. Two chilled water booster pumps in the basement of Building 10 were also installed and will be utilized for circulation of chilled water within the Clinical Center.

Power Plant Unit Fourth Boiler: In February 1969, work on the Fourth Boiler was completed to a point where it was possible for the Bureau of Mines to make final acceptance tests. Of the numerous tests which were made, the boiler failed to pass two of them. Corrections have been made.

Emergency Power: Diesel generator installations at Buildings 2, 3, 4, 5, 6, 7 and 52 (Vault C) were completed late in 1968. Electric power from these generators now can be utilized in the respective buildings. Considerable rewiring, however, must yet be done in each of the buildings to be sure that specific electrical loads are connected directly to the generator if a power failure should occur in the building or on the reservation. Electrical

modifications and rewiring is yet to be done in Buildings 3, 8, 10 (Vaults 1, 3, 4, 5), 29, 29A, 30, 36 and 37 on loads which are to be connected to the turbine-driven generator in the Power Plant, Building 11.

Incinerator - Tagging G.I.Cans: In June 1968, the procedure for tagging all G.I. cans containing material to be incinerated was begun. The procedure was followed well by all I/Ds except for G.I. cans from certain areas in Building 10, and from a few small areas such as snack bars and cafeterias from the outlying buildings. Of the 900 to 1000 cans per day received at the incinerator, approximately 150 are received without tags. Efforts are being made to have these tagged.

Building 29A - Minus 75°C Ultra-Cold Room: From April 1968 through November 1968 mechanical problems continued to plague the low stage section of the compressor which produces the ultra-low temperature on the -75°C Cold Room in Building 29A. Because of these mechanical problems this portion of the compressor was disconnected. The room now is maintained at approximately -50°C and is used by program for emergency storage. Final determination on the ultimate disposition of the cold room and system is yet to be made.

Disposable Glassware: Several years ago the volume of disposable glassware and excess quantities of standard glassware being received at the incinerator with other refuse became such as to cause serious problems. The incinerator can accept only limited quantities of glass without interfering with the burning operations. Since much of the glassware contains tissue, sera, etc., it cannot be disposed of by hauling to a commercial refuse dump, particularly in warm weather. An interim procedure was adopted under which the glassware was machine-crushed, given a light water rinse, and hauled to the Rockville dump operated by Montgomery County. Tests of air samples made by the Environmental Services Branch, and physical examinations of employees working with the material, led to the conclusion that the interim procedures were potentially hazardous to the employees. A contract was awarded in March 1969, under which a private firm picks up the material and hauls it in a special vehicle to a landfill operation under controlled conditions. The new incinerator to be built at Forest Glen is being designed to handle glassware, and when it is placed in operation in about two years, the disposal contract need not be continued.

Labor-Management Relations: A new agreement was negotiated with the Washington Area Metal Trades Council covering wage-grade employees of the Grounds Maintenance and Landscaping Section.

Training: The Branch supported approximately 763 man days of formal training in FY 1969, or roughly one and one-half man days per employee. This represents an increase of approximately 40 per cent over the training man days logged in the previous fiscal year. A total of 122 individuals, or 22 per cent of the total work force, participated.

In-service and interagency training accounted for 486 man days, consisting primarily of a formal refrigeration and air conditioning course taught within the Branch and a basic skills course attended by nine persons and taught at

NIH by an instructor provided by Montgomery County. Also included in this category were a Landscape Gardening course taught at Phelps High School, D. C., and attended by six NIH employees, accounting for 108 man days. A course for first-line supervisors entitled, "Understanding Employee Problems", taught by an NIH psychiatrist, has been very highly regarded by all who attended it, although because of the popularity of this course, only two PEB candidates were allowed to attend during the past year. Inter-agency training consisted of ten man days at a high level management course entitled, "Management of Organizations", attended by the chief of the Branch.

Non-Government courses attended by 76 persons accounted for 277 man days of training. These included courses on Effective Supervisory Leadership (30 persons, 150 man days); courses on control instruments conducted by the Robertshaw Company (23 persons); an Agronomy Short Course attended by four persons (12 man days) and six ICS Electrician courses. Also included were courses on Short Interval Scheduling (5 persons), Welding Fundamentals for Supervisors (2 persons), a Reading Improvement course (1 person) and an AMA course on "How to Plan and Organize Your Work", (1 person) and an industrial course on Refrigeration and Air Conditioning Equipment and Instrumentation (4 persons).

D. Problems

Personnel Levels: For the Plant Engineering Branch this has been a year in which the demands for service have grown by leaps and bounds as a result of the completion of new Buildings 31C, 35, 36, 37 and 41. These require additional manpower for operation and maintenance as well as for the greatly increased volume of program alterations. General reorganization of NIH, including addition of the Bureau of Health Professions Education and Manpower Training, also contributed to the unusual PEB workload due to the many office moves. Mandatory controls on personnel ceilings prevented enlargement of the staff as previously planned. Some internal adjustments were made to meet priority requirements but two areas had to be slighted due directly to manpower shortages, i.e., responsiveness on completion of station labor program alterations and further deterioration in the maintenance of grounds, roads and walks. As of March 31, 1969, the Branch had eight employees less than as of July 1, 1968. Comparative on-board figures, by section, are as follows:

July 1968		March 1969	
O/C	10	O/C	9
GML	52	GML	52
PCS	36	PCS	35
MES	257	MES	256
Shops	176	Shops	173
	531		525
Shop Stores	25	Shop Stores	23
Total	556	Total	548

If the cutbacks in personnel ceilings continue, it soon may become necessary to restudy staff distribution to determine in which areas and the extent to which PEB services will have to be curtailed.

Incinerator: In FY 1967 new Rotoclone exhaust gas scrubbers were installed in the central incinerator to eliminate the release of fly ash and other particles into the atmosphere. Basically, the scrubbers performed satisfactorily for their intended purpose, but major maintenance problems arose which were not foreseen either by the NIH staff or consultants retained to design the system. Because of high acidity of the effluent, there has been considerable corrosion to waste lines and scrubber components, requiring replacement. Efforts have been made on a continuing basis, through temporary repairs, to keep the scrubbers operational until the new Forest Glen incinerator is constructed, at which time the present incinerator is to be abandoned. There have been times, however, when the incinerator burners have had to be operated on natural draft when the scrubbers were under repair, with considerable release of smoke and fly ash.

Grounds: The general condition of the grounds has continued to leave much to be desired. While most of the trenching and building construction was completed, which had kept much of the campus in "eyesore" condition for several years, manpower and other personnel problems did not permit bringing all areas up to the level of "polish" which is indicative of well-kept grounds. GML was forced to operate with a reduced supervisory staff during much of the year. One foreman position, which could not be filled because of a pending equal employment opportunity discrimination case, and which had been vacant for over three years, was not permitted to be filled until late in the year. Other problems were caused by illness.

Where new buildings have been completed, the areas which formerly were turfed and maintained largely by gang mowers, etc., were converted to horticultural planting beds, requiring more hand labor.

Safety Shoes: For several years the Branch, in cooperation with the NIH Safety Office, has been trying to establish a safety shoe program, a simple and inexpensive means for employees to buy safety shoes and be properly fitted at NIH. Several administrative difficulties have prevented going ahead with this program but interim arrangements were made with one manufacturer to provide samples. An appreciable number of employees ordered safety shoes, and those received have been highly satisfactory. However, the degree of participation has dropped off considerably. A program of this kind cannot be really successful unless a safety shoe store with adequate stocks and sizes is available for immediate fitting and sale. An alternative would be government-furnished safety shoes.

E. Program Plans

Operating Plans: Long and short-range plans used to direct the day-to-day business of the Branch include: (a) operating budget and related reports; (b) daily reports from the preventive maintenance system as needed to generate the maintenance needs requiring immediate attention, and monthly and annual reports for major repair and improvement program plans; (c) weekly workload reports which reflect the estimated craft labor requirements by trade; (d) weekly personnel status reports which report the available manpower by organizational unit resulting from personnel attrition and recruitment; and (e) monthly Shop Stores status reports.

F. Publications

(None in FY 1969)

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Amazing Research.
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http://nihlibrary.nih.gov
10 Center Drive
Bethesda, MD 20892-1150
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